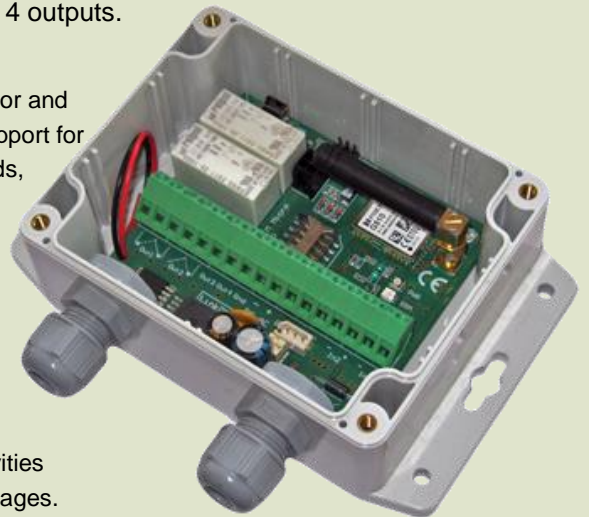


# LMD-GSM Sealbox

Module for mass communication, remote/automatic control and event registration, LMD-GSM Sealbox, is a modern and compact device mounted in a sealed enclosure, designed to inform about the status change of 3 digital opto-isolated inputs via SMS, CLIP (500 phone numbers assigned to 8 groups) and GPRS (SMTP protocol) through the means of using an industrial GSM module, as well as an intelligent algorithm for the automation of inputs and 4 outputs.

- Support for 500 users, all assignable to 8 groups that can be configured for messaging and input/output control.
- Main power supply via AC / DC with additional LiPo battery supply installed in a sealed IP65 enclosure.
- Digital opto-isolated inputs 0-24V AC / DC reacting with a separate event for the transition to low and high states lasting for the given breach and return intervals, detected with the resolution of 10 milliseconds.
- Transmission test event which can be configured to send messages at user-specified intervals.
- Possibility to limit the number of SMS messages regarding the change of inputs' status for a given interval.
- Events of shortage and return of the main power supply, and the low level of battery supply after a given interval.
- Airplane mode (functionality that blocks sending any messages).
- Extensive remote control of the device via SMS commands.
- GPRS (2G) with email (SMTP+SSL).
- Temperature sensor and humidity meter support for checking thresholds, informing via messages and recording measurements in memory.
- LEDs informing about ongoing GSM module activities and sending messages.
- Work schedule of group users for sending input messages and the authorisation of incoming calls by hour, days and months.
- Internal clock continuously synchronised with the date and time provided by the network operator or via GPRS, enabling descriptive logging of up to 5500 latest events in memory.
- Authorising incoming calls from unknown numbers as a given group on demand.
- Changing outputs' status (relays or OC) permanently or interim via SMS / CLIP, after reaction on inputs or according to a configured automation scheme (timing and/or logical functions in real time) enable an intelligent control of the external device.
- Telemetry: recurring reporting of temperature, humidity and/or latest 400 logs via email messages.
- Continuous analysis of the network signal to detect a lost registration and quickly attempt to regain it in order to ensure maximum uptime.



The configuration of the device is performed with the USB mini cable in the Windows environment by using the dedicated programming software available on the manufacturer's website.

# Technical Data of LMD-GSM Sealbox

General Parameters	
Power supply:	9-25V (for AC voltage) 9-30V (for DC voltage)
Current draw:	90-160mA (depending on the number of outputs set on) 400mA (average during transmission) 3A (max)
Battery supply (cooperation):	Lithium-polymer 3.7V ≥ 650mAh
Battery charging current:	500mA max
System protection:	Polymer fuse (resettable) for DC power supply Varistor 30VDC
Input type:	Digital (binary) opto-isolated Operating range of 0-24V AC / DC Threshold to excite high state ≥ 5V
Output load:	Out1 – 16A / 30VDC (monostable relay: SPDT) Out2 – 16A / 30VDC (monostable relay: SPST NO) Out3, Out4 – 0.5A / 30VDC (OC transistor)
Operating frequency, transmission power:	-109dBm (GSM850, EGSM900) -108dBm (DCS1800, PCS1900)
Operating temperature:	-20 to 55°C
Dimension:	Polycarbonate sealed enclosure (IP65 class) 145 x 90 x 55 mm

Assembled in a sealed enclosure with an internal antenna, micro SIM socket and 2 glands for hermetic wiring, optionally with an internal lithium-polymer battery.

Main power supply of the device with either direct or alternating voltage 50Hz, optionally maintained by the connected battery.

Possibility to connect an external antenna via a shielded cable and the temperature & humidity measurer through the glands.

Main purpose of the device is to inform of events (breach or return) occurring on 3 digital opto-isolated inputs, programmed with the initial polarisation of either HIGH or LOW, by sending SMS / CLIP / GPRS messages.

Separate declaration of time to trigger the response for the breach and the return of polarisation for each digital opto-isolated input.

Digital opto-isolated inputs make it possible to connect the wiring for either direct or alternating voltage.

External devices can be controlled via remotely (SMS / CLIP) and automatically controlled outputs of type: relay (Out1 and Out2) and transistor (Out3 and Out4).

Device supports 500 users assigned to 8 groups, giving the possibility of separate configuration of sending messages for events, authorisation of incoming calls and remote SMS control for each group.

Sends message for both technical and alarm events.

GPRS (2G) in the form of sending email messages with the SMTP protocol (SSL supported).

4 module work modes: SMS+CLIP, GPRS, GPRS+SMS+CLIP, GPRS: SMS when GPRS failure.

Possibility to both configure and remote control the device with specific SMS commands (total of 33).

Support for USSD codes in order to control the account and services on the micro SIM card.

Registers events in memory with the help of the internal clock synchronised with the network: read and write up to 5500 logs.

Supports NTP protocol for either remote or emergency synchronisation of the clock's date and time via the Internet.

Automates the operation of outputs and inputs according to a configurable timing algorithm (8 timers defined by selected time, days and months) and functional (8 profiles with 8 arguments for 45 elements), optionally in real time of operation.

Executing functions of automation for the direct triggering of sending messages from inputs' events, blocking inputs, changing outputs' status, and other functionalities by the remote SMS control or incoming calls from authorised users belonging to 8 groups, all according to the declared scheme (6 executing functions with 8 results for 33 elements) or locally upon detecting a change of polarity (reaction) on the inputs.

Ability to perform as a multi-task message gateway through the remote (SMS / CLIP) usage of executing functions of automation for sending messages from inputs' events without the need for wiring and the resulting state analysis.

Sends a *transmission test* message at fixed intervals of time or at a specific time each day (optionally sends an SMS message with the full status of the device).

Informs about the shortage and return of the main AC / DC power supply and the low level of LiPo battery.

Functions of monitoring the cost of SMS, registration with the network operator, signal stability, and adding details (timestamp, the current temperature and humidity) to the content of SMS messages.

Possibility of temporarily blocking inputs (from the state detection) by the remote control or automation.

Ability to control outputs by 500 phone numbers using the CLIP service (separate configuration of the device behaviour for each user assigned to a given group when rejecting an incoming call) for toll-free control.

Possibility of setting on each output for a declared time (after its passing the output is immediately set off), optionally after providing its name that can be declared during programming.

Incoming calls from unknown phone numbers can be authorised as belonging a given group.

Remote and local actions/events triggered for each group can be configured to occur according to a specific schedule, the range of which is defined by timers.

Intuitive exploitation due to the presence of LED diodes, specific SMS commands and programming via the interface.

Airplane mode allows to block either remotely or locally any broadcasting of messages to users.

Continuous analysis of the temperature and humidity by the sensor either mounted internally within the enclosure or externally via glands, optionally with notifying the selected groups of users, by triggering events after crossing the declared thresholds .

Possibility of storing the temperature and humidity measurements in the device memory as logs at the declared time interval.

Telemetry of temperature and humidity through the functionality of interval reporting of the stored measurements (optionally with a timestamp) by email messages.

Telemetry (report) of the latest 400 logs in the device memory sent as an email attachment that can be read by the interface.

Geolocation of the device based on a SMS message giving the approximate position of latitude and longitude.

Continuous analysis of all aspects of the GSM module operation and efficient resolving of any issues in order to ensure a stable and reliable functioning of the device, as well as the maximum uptime.

Software written to allow the device to work and communicate in many languages, namely Polish and English.

Installation of the device, for safety reasons, should be performed by qualified specialists.

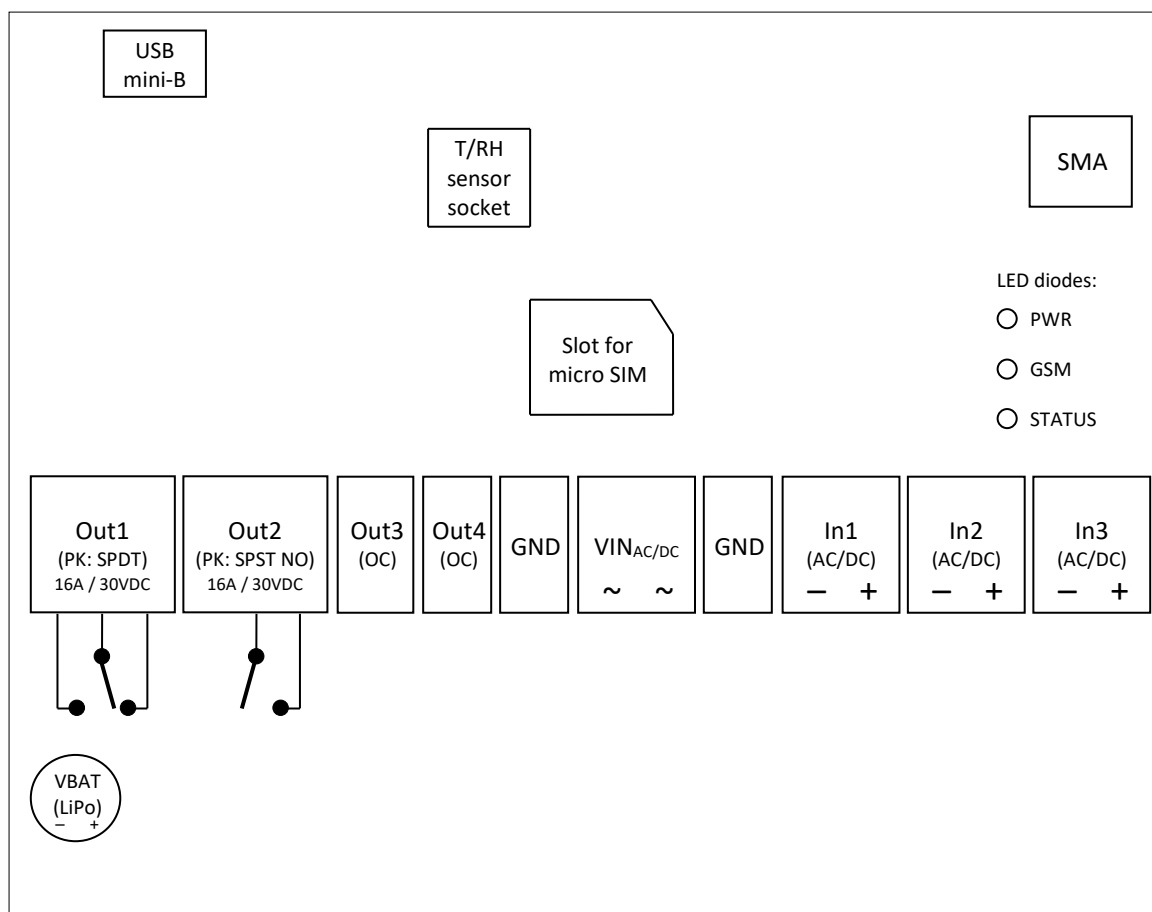
Reading and understanding the documentation will ensure proper and safe exploitation of the device and its equipment.

The power should not be turned on without the connected antenna, neither should other installation operations when the device is not in use.

Electronics must be properly protected against any electrostatic discharge.

The device must be installed in a metal housing in order to meet the requirements of the European Union regarding the LVD and EMC. They concern compliance with the norms of power supply, installation and shielding, given that the device is a source of electromagnetic waves and, in specific configurations, may interfere with other radio devices.

# Overview of the layout of components and connectors



## Warranty

Manufacturer is not responsible in any way for the proper operation of the network infrastructure of GSM operators used for the SMS, CLIP and GPRS alarm notifications.

Manufacturer is not responsible in any way for the improper operation of the device due to short-sighted and/or faulty configuration of the given outputs automation or inputs blocking.

Manufacturer is confident that the device was built to function properly for many years in the right conditions. If, however, within two years from the delivery of the goods malfunctions occur in its operation, they will be resolved free of charge. For such a scenario, the device must be delivered to the purchase point, or to the manufacturer at the expense of the third party.

Warranty covers the territory of Poland, and lasts 24 months from the delivery of the goods.

Warranty does not cover: mechanical, thermal and flooding damages. The device should be protected from the weather, especially the rain and sunlight.

Manufacturer's liability is limited to the amount of the value of the device.

Warranty on the sold goods does not exclude, limit or suspend the rights of the buyer resulting from the non-compliance of the goods with the contract.

# Documentation

Manufacturer is not liable for errors made during printing and any errors in the content of the technical documentation.

Simultaneously, the manufacturer wishes to specify that every effort will be made to maintain the high quality of the hardware, software and documentation.

Information about new products and changes will always be available on the manufacturer's website.

**Documentation version:** 1.2 (*February 2018*)

# Software

Firmware	Dedicated interface	Description
1.0.0	<i>Programmer Link GSM Sealbox v1.0</i>	Release version, put into production and sales
1.1.0	<i>Programmer Link GSM Sealbox v1.1</i>	New feature: logs report
1.2.0	<i>Programmer Link GSM Sealbox v1.2</i>	New feature: type of voltage on inputs for better detection
1.3.0	<i>Programmer Link GSM Sealbox v1.2</i>	New hardware: LED indicators for outputs

# Manufacturer

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# WEEE Mark



Waste from electrical and electronic equipment should not be disposed with general household waste. For proper treatment, recovery and recycling, please take this product to designated collection points where it will be accepted free of charge. Check with your Local Authority or retailer for recycling advice.



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# User manual for LMD-GSM Sealbox

## First start and service

1. Check that the micro SIM card is removed. If not, it should be removed from the slot.  
*NOTE: leaving the card with a set PIN may cause blockage. Factory new SIM cards should be first configured on a mobile phone, namely disabling unnecessary network functions and automated messages, voicemail and configuring the correct SMS centre number.*
2. Connect properly the wiring of inputs and outputs.
3. Connect the power supply. The following connection options are possible:
  - Voltage of the secondary winding of the network transformer in the range 9-25 VAC connected to the terminals of  $VIN_{AC/DC}$ .
  - DC power supply in the range 9-30 VDC connected to the terminals of  $VIN_{AC/DC}$ .  
*NOTE: direction of the current flow is irrelevant due to the rectifying by the Graetz bridge.*
  - Device can be independently supported by 3.7 VDC lithium-polymer (buffering) battery, placed inside the enclosure and connected to the terminal of  $VBAT$ . The battery will be recharged from the voltage converter circuit, and in the event of lack (or shortage) of power supply on terminals of  $VIN_{AC/DC}$  the battery will keep the device working until the voltage returns or its discharge.
4. Wait about 20 seconds for the device to start. Operational readiness will be signalled by the blinking of the *STATUS* diode, indicating the lack of a micro SIM card (no operator network registration to be specific).  
*NOTE: emergency communication with the programmer (only reading and writing configuration data) is also possible for about 5 seconds after turning on the power.*
5. Connect the device to the computer with the USB mini cable and program it with the designated interface.
6. After successful programming, disconnect the power supply, insert the micro SIM card in the designated slot and reconnect the power supply in order to start the device.

## Programming with the „Programmer Link GSM Sealbox” interface

For proper operation of the „Programmer Link GSM Sealbox” application, a PC running the operating system **Microsoft Windows** (architecture x86 or x64) with installed **Microsoft .NET Framework 4.0** is required. Computer must have a USB port. A proper cable is required that will connect the computer’s USB port with the device’s **USB mini-B** port. The interface works properly on the following operating systems:

- Windows: XP, Server 2003, Vista, Server 2008, 7, 8, 10

Microsoft .NET Framework 4.0 can be downloaded via Windows Update or:

- <https://www.microsoft.com/en-us/download/details.aspx?id=17851>

The programming interface can be run in two languages: Polish and English. Programming the device with the chosen language automatically determines and sets the language in which the device communicates.

## Installing the programmer

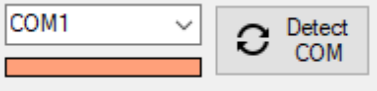

Download the [Programmer Link GSM Sealbox](#) application from the manufacturer’s website, unpack the contents and run the „setup.exe” installation file.

The USB cable communicates with the device via the serial transmission, and may require an additional installation of drivers (especially on older operating systems), which are also available on the manufacturer’s website.



## Choosing and saving the configuration

In order to program the device, perform the following steps:

1. Connect the programming cable plug to a free USB port on the computer.
2. Run the „Programmer Link GSM Sealbox” programming interface.
3. Connect the power supply and wait 20 seconds for the device to start and initialise.
4. Connect the programming cable plug to the USB mini-B socket on the device.
5. In the window of the programming interface, the proper COM port must be selected for the communication with the device. The port selection box shows a list of all available COM ports. The connection test can be performed by clicking on the orange bar under the port selection box. After clicking and analysis, the bar will change colour. The red colour means no connection, green – proper connection with the device. To auto-detect the COM port, click on the “Detect COM” button. The interface will automatically check the presence of the device on each port, and then notify about its detection (or lack of).
6. Complete the relevant fields and make selections according to the needs (use only ASCII characters for fields).
  - The programming interface was created to be as intuitive as possible, each field and selection can display a meaningful hint when holding the mouse cursor over them.
7. All functionalities of a non-programmed device are disabled by default. No undesirable action will take place until it is turned on and properly configured by the end-user.
8. After choosing the configuration in the interface, click the „Send” button in order to save them. The status bar (on the bottom) shows the progress of the communication in real time. There are also actions of <save/open> <to/from a config file> and <read/erase> memory. Programming action is possible at any time after the device finishes the initialisation procedure (about 20 seconds after being turned on or saving settings – successful overwriting of the device memory causes its reset), when the device is not performing any action through the GSM module (in other words, is busy). Emergency transmission (only reading or sending configuration data) is also possible for about 5 seconds after turning on the device.

## Configuration: identification

- Device supports up to 500 phone numbers simultaneously Each number must be provided in the international format, e.g. +48600100200  
*NOTE: providing a non-international number may cause unpredictable operation when sending messages and authorising incoming calls.*  
*NOTE: each phone number must be distinct. The analysis and authorisation of phone numbers does not foresee more than one occurrence of a given number.*
- Each phone number must be assigned to one of 8 individually configurable groups.
- Editing tools for telephones list are provided to ease completing and managing numbers.
  - Find telephone: searching for the first occurrence of the given number on the telephones list and checking the relevant box. Exact number must be specified - no searching by similarity.
  - Set the groups by T1: assigning the group selected for telephone T1 to all the group fields on the telephones list which have any value entered in the number column.
  - Clear the telephones list: clearing the columns of numbers and groups of all the rows to the default state.
  - Export the telephones list: export the telephones list to a Microsoft Excel Open XML Format Spreadsheet (XLSX).
- Identification fields in yellow are filled with information about the device after the status check.

## Configuration: settings

- SMS messages limit: choosing the maximum number of SMS messages to be sent as a reaction to the inputs' state changes within 12 hours (0-1000). The limit does not apply to the messages generated by events, transmission test and remote control.  
*NOTE: value of 0 disables the limiting of input messages.*
- SMS sending time: maximum waiting time for the confirmation of sending the SMS message by GSM module to a given telephone number, before the device considers the attempt to be a failure (10-60 seconds).
- SMS attempts to send: number of attempts to send an SMS message to a given telephone number, before the device deletes the message from the buffer and aborts any further attempts (1-12).
- CLIP calling time: maximum time of sending a CLIP message (calling) regarding inputs and the transmission test events, starting the instant the telephone number is selected and called (5-60 seconds).  
*NOTE: the GSM module requires at least 5 seconds to dial the number.*
- CLIP delay between each call: delay between every CLIP message (calling) to a phone number (0-250 seconds).  
*NOTE: value of 0 is equal to no delay.*
- CLIP number of calls: number of times a CLIP message to a phone number is to be sent in a row (1-10).
- PIN code: for unlocking the SIM card. Empty when no PIN code (*recommended*), or consisting of 4 numbers.
- Remote SMS password: empty when remote SMS control is to be disabled, or consisting of 5 characters (letters and numbers, no special characters) to enable.
- GMT zone: choice of the GMT zone for the internal clock operation (from GMT-11 to GMT+12). The clock stores the time for GMT+0 (universal time), the device manipulates the time to accommodate to the chosen time zone.  
*NOTE: possibility of the automatic adjustment of the clock for Daylight Saving Time (look at options).*
- Sensor of temperature and meter of humidity are functionalities that operate independently of each other. The sensor detects temperature, while the meter measures the relative humidity. Both values are obtained from one physical wired measurer, which must be connected to the specified socket on the device for proper operation.
- Setting (sensor of temperature): enable or disable the sensor of temperature.
- Sensor H: detects high ambient temperatures. Buffers an event when a higher temperature than chosen is detected (ambient temperature > Sensor H temperature). Temperature in Celsius (from -35 to 120C).  
In the text field, content of the SMS / SMTP message (up to 30 characters).
- Sensor L: detects low ambient temperatures. Buffers an event when a lower temperature than chosen is detected (ambient temperature < Sensor L temperature). Temperature in Celsius (from -35 to 120C).  
In the text field, content of the SMS / SMTP message (up to 30 characters).
- Save temperature in logs: selecting the option causes a periodical logging of the temperature measurement in a selected time interval provided that the sensor of temperature is enabled and the wired measurer is detected by the device (60-60000 seconds).
- Setting (meter of humidity): enable or disable the meter of relative humidity.
- Meter H: detects high ambient humidity. Buffers an event when a higher humidity than chosen is detected (ambient humidity > Meter H humidity). Relative humidity as a percentage (from 1 to 99%).  
In the text field, content of the SMS / SMTP message (up to 30 characters).
- Meter L: detects low ambient humidity. Buffers an event when a lower humidity than chosen is detected (ambient humidity < Meter L humidity). Relative humidity as a percentage (from 1 to 99%).  
In the text field, content of the SMS / SMTP message (up to 30 characters).
- Save humidity in logs: selecting the option causes a periodical logging of the relative humidity measurement in a selected time interval provided that the meter of humidity is enabled and the wired measurer is detected by the device (60-60000 seconds).
- Block reading data from the device: selecting the option results in a permanent reading lock of the data saved in the device memory (until the new data with no reading block is saved).

- Enable airplane mode – no messages sending: selecting the option blocks the sending of any messages to users, they are immediately deleted from the buffers.  
*NOTE: does not affect the functionality of remote SMS control or the handling of incoming calls, applies only to input messages and events generated by the device. GSM module remains operational while the airplane mode is enabled, communication with the operator of the network is still active.*
- Remote SMS control only for chosen groups: option limiting the functionality of the remote SMS control only for the groups which configuration permits their assigned users such control. When enabled, a valid remote SMS command will be ignored when coming from an user who is not assigned to the group that authorises its members to remotely control and configure the device.  
*NOTE: applicable only when the 5-character remote SMS control password is provided.*
- Send unrecognised SMS messages to telephone T1: selecting the option enables the relaying of unrecognised SMS messages to the first number stored in the device memory (T1). Applies also to the messages of the remote SMS control which failed the validation process by the device.  
*NOTE: applicable only when the 1st telephone number is provided on the list. SMS messages are limited to 160 characters, therefore the relayed messaged may be truncated.*
- Confirm remote SMS control by the status message: selecting the option causes the sending of Status SMS as a confirmation of reconfiguration resulting from the remote SMS control immediately upon the successful validation of the command and its argument(s) to the (un)authorised phone number which sent the remote SMS. When the validation fails (wrong remote SMS password, wrong command and/or arguments, unknown phone number when authorisation is required), the device ignores the remote SMS and does not send any notification. Not applicable to the remote SMS commands which do not reconfigure the device but only inform about the status of its individual functionalities.  
*NOTE: applicable only when the 5-character remote SMS control password is provided.*
- Unauthorised incoming calls – Group 8: selecting the option causes a successful validation of incoming calls from unrecognised numbers (not present on the list in the memory) as an user of the 8th group.  
*NOTE: does not apply to the functionality of remote SMS control.*
- Add details to the content of SMS messages: selecting the option causes the addition of the current date and time (inputs and events), temperature measurement (Sensors event) and humidity (Meters event) to the content of SMS message upon sending.
- Do not log the state of sending messages: selecting the option disables the logging of the state of sending messages to users. Information about the success, failure or rejection (e.g. Timer limitations) of sending each messages will not be logged in the memory.
- Do not log the state changes of inputs and outputs: selecting the option disables the logging of inputs and outputs' state changes.
- Attempts to send SMS in global scope: option limiting the number of SMS sending attempts to the global scope of the message, not each individual user for whom it is intended. By default, failure to send a message to an user after exceeding the number of attempts causes the device to move onto the next user within the scope of the message – the number of sending attempts is therefore dependent on the total count of users for whom the message is indented, before its sending procedure is aborted and the message itself is deleted from the buffer. Selecting the option causes the message to be aborted and deleted from the buffer immediately after the number of sending attempts is first exceeded to any user during the sending procedure of the message to all the intended users.
- Automation operates in real time: selecting the option causes the automation of inputs and outputs to occur in real time since the initialisation of the device (simultaneously with the scanning of inputs' state).
- Automatically adjust the clock for Daylight Saving Time: selecting the option will automatically adjust the clock's time to Daylight Saving Time (+1 to the chosen time zone) for CEST.  
*NOTE: if enabled, the chosen GMT zone should be picked in accordance to the Standard Time Daylight saving algorithm for CEST.*

## Configuration: transmission

- Transmission test setting: configuration of the transmission test event.
- Transmission test message: content of the SMS / SMTP message (up to 30 characters).
- Status SMS instead of the message: selecting the option causes the device to send a Status SMS message which includes a full report of the device status instead of the custom message saved in the memory during the event of the transmission test.
- Transmission test message sending: selection of time when the event of transmission test is to be buffered.
  - Intervals of hours: periodic time interval (0-240 hours).  
*NOTE: value of 0 for enabled transmission test with the interval sending makes the event available only via functions executing automation.*
  - Daily at hour: time of day (00:00 – 23:59).  
*NOTE: daily but starting from the day after the initialisation of the device.*
- VBAT low level: content of the SMS / SMTP message for the event of low level of VBAT battery supply (up to 30 characters).
- AC/DC shortage: content of the SMS / SMTP message for the event of return of AC/DC main supply (up to 30 characters).
- AC/DC return: content of the SMS / SMTP message for the event of shortage of AC/DC main supply (up to 30 characters).
- Power supply message sending: selection of time when the power supply events are to be buffered. Values of 0 are equivalent to disabling the events.
  - VBAT every minutes: selection of how many minutes are to pass for the event of low level of VBAT battery supply to be buffered (0-1000 minutes).
  - AC/DC after minutes: selection of how many minutes are to pass for the event of shortage of AC/DC main supply to be buffered (0-1000 minutes). The event is buffered once for every state change of AC/DC. The event of return of AC/DC supply is buffered immediately after determining its stable return.

## Configuration: groups

- Device supports 8 groups which can be freely configured and be assigned to 500 users, and for email configuration.
- Group configuration:
  - Confirm incoming call by the status SMS: selecting the option causes the device to send an SMS message with a full status report as the confirmation of detecting the authorised incoming call to the user who is assigned to one of available groups and dialled the number of the device.
  - Confirm incoming call by the inputs and outputs status SMS: selecting the option causes the device to send an SMS message with a detailed report if inputs and outputs' status as the confirmation of detecting the authorised incoming call to the user who is assigned to one of groups and dialled the number of the device.
  - Enable remote SMS control for the assigned users: option authorising the users of the given group for the remote control of the device via SMS commands.  
*NOTE: applicable only when "Remote SMS control only for selected groups" is enabled as an option in the settings tab.*
  - Incoming calls validation bound by the sum of picked Timers: Selecting the option causes the validation of incoming calls from the users assigned to the selected group to include a time and date constraint set by the chosen Timer limitations. Successful validation for belonging to the union of sets bound by picked Timers.  
*NOTE: when disabled, any timer limitations for incoming calls authorisation are ignored by the device.*

- Input messages bound by the sum of picked Timers: selecting the option causes the sending of messages generated by the inputs to the users assigned to the selected group to include and validate a time and date constraint set by the chosen Timer limitations. Successful validation for belonging to the union of sets bound by picked Timers.

*NOTE: when disabled, any timer limitations for sending input messages to users of the given group are ignored by the device.*

- Each group offers a separate setting for the configuration of sending messages to assigned users as a result of reactions on inputs and other events. The possibility to pick which messages generated by the given input or event will be sent to which phone numbers.
- Possibility to configure a scheme of actions taken after authorising an incoming call from assigned users. Outputs control and executing functions of automation are both possible as a toll free remote functionality.
- Principle of operation of Timer limitations for input messages and incoming calls, as well as a full description of the group configuration can be found in the chapter called “Groups”.

## Configuration: digital opto-isolated inputs

- Device gives the possibility of full configuration of detecting when the polarisation changes (LOW level and HIGH level) occur on 3 digital (binary) opto-isolated inputs.
- In order to enable the analysis of polarisation changes, the default polarity of the input (which is assigned to the given input after the initialisation of the device, from that moment the continuous analysis of state takes place) must be selected.
- Due to their construction, either DC or AC can be connected to inputs. However, the device must be configured to know which input has which type of excitation – otherwise the analysis of state will be inaccurate.
- After turning on the device, each unwired opto-isolated input has 0V or LOW, the threshold for HIGH starts above 5V for DC or 8V for AC.
- Each polarisation change (the breach or return to default) event can be assigned a SMS / SMTP message (up to 100 characters) as well as the time needed to trigger the response for a given polarisation change.  
*NOTE: empty message content for breaching the polarisation of an active input is equivalent to a resignation from a message for this reaction. Similar scenario applies to the message content for returning to default polarisation.*
- Time to trigger the response is given in seconds (with the resolution of 10 milliseconds).
- For an input with HIGH set as the polarisation of a given input, the breach is a reaction resulting from LOW being detected continuously for the given time to trigger the breach, and the return to default occurs when HIGH is again being detected continuously for the given time to trigger the return.  
Similar scenario with LOW set as the polarisation – the breach for HIGH, then the return for LOW reaction.
- Executing functions of automation can be assigned as a direct result of the detection of each reaction on each input. The selected functions will be triggered simultaneously with the buffering of the message on the given input for the given polarisation change.
- Declaration of the scheme of the executing functions of automation should be performed with caution and awareness of the fact that the analysis of inputs’ state occurs in real time. More information about the issue can be found in the chapter called “Inputs”.
- Input with no default polarity programmed is considered by the device as turned off, and automatically skipped during the analysis of state.

## Configuration: outputs

- Possibility to define the state of outputs upon the initialisation of the device. The initial state of the output can be either off (low level – NC) or on (high level – NO).
- Device supports switching the outputs on or off via the automation scheme with logic functions, executing functions of automation and/or remote SMS / CLIP control.
- Name: name of the output (up to 20 characters). Intended for the functionality of setting outputs via given name by remote SMS control.  
*NOTE: output names must be distinct. Leaving an empty field is equivalent to disabling the option of setting the output by providing its name during remote SMS control.*
- Interim on seconds: selection of time for the output to be temporarily set on (1-65000 seconds). Intended for the functionality of interim setting outputs on by the remote SMS control, incoming calls (toll free) and/or functions executing automation.

## Configuration: GPRS

- Device with any GPRS mode turned on and the email account configured, buffers GPRS messages for all the selected reactions on inputs and other events, and sends them as an email to a given recipient.
- As the subject of the email, the device concatenates the sender title (in square brackets, only if provided) and the given message content stored in memory (which are meant for both SMS and SMTP messages). Therefore, in order to properly identify messages from the device, all the fields for the desired messages must be filled.  
*NOTE: in case of SMTP messages generated by the changes of polarisation on inputs, leaving an empty message content field is equivalent to a resignation from an email for this reaction.*
- Device offers 4 work modes for the operation of GSM module.
- For any work mode which supports GPRS, the device establishes a permanent 2G connection in order to immediately send any messages which may be buffered as emails via SMTP.  
*NOTE: the device sends no other transmission via GPRS, excluding NTP and geolocation services which are on demand via configuration or remote SMS control.*
- SMS+CLIP mode: GPRS is turned off. Only SMS and CLIP messages are supported.
- GPRS mode: GPRS is turned on. SMS and CLIP messages are not supported..  
*NOTE: this mode does not affect the availability of functionalities such as remote SMS control or incoming calls.*
- GPRS+SMS+CLIP mode: GPRS is turned on. SMS and CLIP messages are supported simultaneously with SMTP email messages.
- GPRS (SMS when GPRS failure) mode: GPRS is turned on. SMS messages are supported only in the case of a message sending failure by GPRS - the buffered SMS message is equivalent to that of the event which was being handled by the GPRS sending attempts (transferred from GPRS to SMS buffer).  
*NOTE: This mode does not affect the availability of functionalities such as remote SMS control or incoming calls.*
- Refresh GSM connection every 48 hours: selecting the option causes the refresh of GSM connection every 48 hours (turning it off and on again) with the network operator in order to refresh the transmission and ensure a high level of signal.  
*NOTE: manufacturer recommends this option to be turned on in case of GPRS transmission being enabled.*
- APN: Access Point Name for GPRS transmission (up to 35 characters).
- User: APN user for GPRS transmission (up to 25 characters).
- Password: APN password (up to 25 characters).
- Test GPRS: selection of time interval when the quality and status of GPRS connection is to be periodically checked, and attempted to be restored in case of losing connection with the network operator (30-250 seconds)

- Send attempts: number of attempts to send a GPRS message (emails via SMTP) before the device abandons further action and deletes the buffered message (1-15 attempts).
- Update date and time via NTP: selecting the option causes downloading date and time from the Internet via NTP protocol and updating the clock in case of the clock failure (error when synchronising the clock with operator's date and time during the device initialisation) provided that GPRS is configured and activated. Failsafe synchronisation of date and time in order to guarantee proper operation of the device.  
*NOTE: The internal clock is updated using the new date and time in accordance with the GMT zone and DST setting (universal time GMT+0 is fetched via NTP).*
- Server: SMTP server address of the designated email account (up to 35 characters).
- Port: SMTP server's port number (0-65535).
- User: username for the authentication in the chosen SMTP server (up to 25 characters).  
*NOTE: leaving this field empty causes the device to use the sender address as the username during the configuration of the SMTP server connection.*
- Password: for the authentication in the chosen SMTP server (up to 25 characters).
- Encryption: selecting the option enables SSL encryption for the purpose of transmission with the chosen SMTP server.
- Email limit: maximum number of email messages that can be sent within 12 hours (from -1 to 1000). The limit does not apply to the functionality of the telemetry. Active SMTP limit is not qualified by the device as a problem with GPRS connection for the appropriate work mode.  
*NOTE: value of 0 is equivalent to the lack of a limit.*  
*NOTE: value of -1 causes all the buffered events (excluding the telemetry) to be immediately deleted and ergo not attempted to be sent (the option of sending telemetry reports exclusively for enabled GPRS).*
- Sending time: maximum waiting time for the confirmation of sending the email message by the GSM module before the device deems the sending attempt to be a failure (30-250 seconds).
- Sending delay: interval between the sending of the buffered email messages (0-250 seconds).  
*NOTE: value of 0 is equivalent to the lack of delay.*
- Sender title: sender name e.g. full name and surname of the owner or the IMEI number of the device (up to 35 characters). Included optionally to the title of the email in square brackets.  
*NOTE: not providing the sender information is equivalent to the resignation of adding the custom identifier to the title of each email.*
- Sender group: selection of one of all groups, the configuration of which is to determine the transmission of messages regarding inputs and events. When sending an email, the device considers the messages' sending configuration (inputs and events messages, including the Timer limitations by which the input messages might be bound) for the selected group to its intended users, where the email recipient becomes the only end user.  
*NOTE: specific email limit value has precedence over the sending configuration for the selected group.*
- Sender address: sender email address of the account (up to 35 characters).
- Recipient address: recipient address (up to 35 characters). The main address upon which the buffered email message is to be sent.  
*NOTE: no address is equivalent to the resignation of sending email messages for the recipient.*
- Message body: selecting the option causes the device to add a full status report to the body of the email message (device name, clock time, operator and signal strength, temperature, humidity, AC/DC presence, VBAT level, logs count, GPRS status, inputs and outputs state, sent messages within the limit).  
*NOTE: not applicable to the telemetry reports.*
- Telemetry (sensor of temperature) setting: enable or disable the temperature telemetry reports via email messages.  
*NOTE: it is required to enable the functionality of the sensor of temperature, as well as select the option to periodically save the temperature in logs in order to ensure the proper operation of the telemetry.*

- Telemetry (meter of humidity) setting: enable or disable the humidity telemetry reports via email messages.  
*NOTE: it is required to enable the functionality of the meter of humidity as well as select the option to periodically save the humidity in logs in order to ensure the proper operation of the telemetry.*
- Include each reading's date and time: selecting the option causes the device to add a timestamp next to the humidity reading taken from the logs in the message body of the telemetry report for each reading (format DD-MM-YY HH:MM).
- Telemetry sending: configuring how often the event of telemetry is to be buffered.
  - Intervals of hours: selection of periodic time interval (1-240 hours).
  - Daily at hour: time of the day (00:00 – 23:59).  
*NOTE: daily but starting from the day after the initialisation of the device.*

## Configuration: automation

- Automation offers direct control of the operation of inputs and outputs according to a fully configurable timing and/or logical functions algorithm.
- Configuration of automation is only possible by using the “Programmer Link GSM Sealbox” interface.
- Device does not detect or improve the configuration scheme of automation in case of logical conflicts, therefore the automation of inputs / outputs should be thought over and designed by the user with caution.
- Automation takes the highest precedent over the control of outputs and inputs state, mostly due to the fact of its periodical operation (optionally continuous in real time).
- By default, the automation takes place when the device is idling (not actively sending messages, checking periodic events or being remotely controlled). However, setting on the option of performing the automation in real time results in the automation being conducted simultaneously with the continuous state analysis of inputs.
- Executing functions of automation can be used to directly manipulate the state of the device (inputs and outputs state and other events). Triggering of specific automation be either remote SMS (commands) / CLIP (toll free incoming calls) control or locally (as a result of reactions on inputs). For incoming calls, a scheme of operation for each group must be configured. For the local, a scheme of choice must be configured regarding which executing functions are to be triggered upon a specific reaction on a specific input.
- Full description of the operation and configuration of the automation can be found in the chapter called “Automation”.

## Configuration: logs

- Read logs: clicking the button results in reading the logs from the device memory, and filling the table with them. Progress of reading can be seen on the bottom bar of the interface.
- Erase logs: clicking the button results in erasing the logs from the device memory.
- Export logs: clicking the button results in exporting the logs from the table (first the logs have to be read from the device memory) to a file in Microsoft Excel Open XML Format Spreadsheet (XLSX) format.
- More information about logs can be found in the chapter called “Logs”.



## LED diodes: information about status and operation

- Device has 3 LED diodes:
  - *PWR*: two coloured. Informs about the presence of power supply and the lack of readiness of the GSM module (red colour), or the presence of power supply and the readiness of the GSM module as well as positive network registration (green colour).
  - *GSM*: single colour. Informs of active use of the GSM module (e.g. sending a message).
  - *STATUS*: single colour. Visually informs about various actions being conducted by the device or about state changes.
- Having turned on the power, the device signals the ongoing initialisation process by switching on the *PWR* diode in red colour, and switching on the *GSM* diode.
- After finishing the initialisation process (about 20 seconds), if the module was properly configured, the micro SIM card was unlocked and the network was successfully registered, the *PWR* diode changes the colour to green, and the *GSM* diode turns off.

*NOTE: from this moment, it is possible to communicate with the device via the "Programmer Link GSM Sealbox" interface when it is idling (GSM diode is turned off). Alternatively, the emergency communication (only reading and writing configuration data) is also possible for about 5 seconds after supplying the power.*
- Continuous blinking of the *STATUS* diode with the frequency of 1 second, while the *PWR* diode is turned on with the red colour, indicates that SIM card was not detected, or there is no network registration. In such a scenario, the device will regularly check the presence of the card and attempt to connect with the network. While sending messages is naturally being prevented, all the other functionalities still take place.

*NOTE: other functionalities such as the continuous state analysis of inputs or automation.*
- Continuous blinking of the *STATUS* diode with the frequency of 150ms, while the *PWR* diode is turned on with the red colour, indicates that the device is essentially hanged due to providing a wrong PIN code when it is required for unlocking the SIM card.

*NOTE: such a permanent blocking of the operation requires a manual reset of the device.*
- Alternating blinking of both the *STATUS* diode and *PWR* diode in red colour with the frequency of 200ms for 6 seconds, indicates that the GSM module does not respond to the commands sent by the device (in essence, failure). In such a scenario, the device will become blocked while attempting to enforce the operation of the GSM module. While sending messages is naturally being prevented, all the other functionalities still take place.

*NOTE: other functionalities such as the continuous state analysis of inputs or automation.*
- *PWR* diode changing colour from red to green for 1 second indicates that the loss of GPRS was detected.
- Brief flash of *GSM* diode indicates that a new incoming SMS message was detected, or an incoming call was authorised.
- Brief flash of *STATUS* diode indicates that a reaction was registered on an input.

Operation of GSM module indicated by *PWR* in green and *GSM* diodes being turned on simultaneously:

- No blinking or flashing of *STATUS* diode indicates an ongoing sending of SMS / CLIP / GPRS message.
- *PWR* diode being turned off with *STATUS* diode being turned on for 200ms (and *PWR* diode being turned on in green colour with *STATUS* diode being turned off afterwards) indicates that the SMS / CLIP / GPRS message was successfully sent.
- *PWR* diode changing colour from green to red for 200ms (and again to green afterwards) while the *STATUS* diode stays turned off indicates that the SMS / CLIP / GPRS message was not successfully sent (error).
- *STATUS* diode being constantly turned on indicates an ongoing process of establishing the GPRS connection.

# Operation of LMD-GSM Sealbox

LMD-GSM registers up to 600 events simultaneously in its internal buffer, each for potentially 500 users. This allows for a robust notification system via SMS / CLIP / GPRS (SMTP) message about the changing state in real time. Events are removed from the buffer after attempting the transmission to all the selected users. In case of failure to send an SMS or GPRS message, the device will try to resend. The configuration of the events registration in the buffer should be declared in the device memory with caution, as the buffer overflow results in flushing all the awaiting events.

Device can be programmed for 4 working modes of the GSM module that determine the GPRS operation status and which type of messages are allowed to be buffered. There is a possibility of enabling additional security of GPRS communication by the SSL cryptographic protocol.

Memory of the device can store up to 500 user phone numbers, all of which must be assigned to one of 8 groups. The configuration of groups allows to determine which type of messages should be sent and for what events to their users. Moreover, groups can have an authorisation and execution scheme for the remote SMS control or the incoming calls. Groups can also be assigned an operating schedule for the registration of input messages and authorising incoming calls, which regulate at what time, months and days of the week can those actions be performed (if not, they are flushed from the buffer).

Durable and sealed enclosure in the IP65 standard, as well as a stable operation for a wide range of voltages with different waveforms (direct or alternating) allow operation of the device in harsh environmental conditions for various types of connections with the electrical network. An additional power supply in the form of a lithium-polymer battery put within the enclosure ensures an uninterrupted operation in case of the main power supply shortage.

Cable glands assembled into the enclosure allow for the hermetic wiring of the device in order to maintain the IP65 protection standard. External antenna can be connected via a shielded cable, as well as the temperature & humidity measurer and external devices to the inputs and outputs.

Device constantly monitors the status of the industrial GSM module to ensure a stable and reliable operation of the device, and to prevent and eliminate the occurrence of anomalies. Failure to register the network or GPRS connection with the operator results in detecting an invalid state, and activates taking steps to either recover or try and force the registration.

Internal clock of the GSM module is synchronised with the date and time provided by the network operator, and is used for a detailed log recording of all the activities performed by the device. Up to 5500 logs can be read and written in memory. The configuration of the device allows the selection of which information is to be recorded in logs.

Date and time of the clock are set according to the regional data provided by the network operator after the first initialisation of the device and a successful registration of the network. Software support for parsing the clock with the time zone and Daylight Saving Time (CEST). Possibility to set the clock via remote SMS control by either providing the clock data, or triggering the synchronisation via the GPRS (NTP). Optional NTP synchronisation can be enabled in case of the failure to receive the regional data from the operator after the first initialisation.

Extensive remote control of the device through SMS commands allows to safely manipulate the state of the device by authorised users, without the analysis interruption. Possibility to reconfigure the device, manually buffer events or run USSD codes. For commands that require the GPRS connection, e.g. clock synchronisation via NTP or the geolocation of the device, if there is no active connection, the device temporarily establishes one in order to provide a seamless execution of the given command.

Airplane mode, remotely or locally configurable, provides the device with the functionality to turn off the broadcasting of messages, without compromising the functionality of the remote SMS control or authorisation of incoming calls. When enabled, it takes precedence over the buffering of messages by blocking it, whilst the GSM module is still fully operational.

Possibility to limit the costs by configuring a limit of the number of SMS messages generated by the input reactions, and all SMTP messages within the time interval (12 hours fixed). After exceeding the limits, the device blocks the buffering of SMS and/or SMTP messages until the reset of the time interval countdown.

Polarisation state of the digital opto-isolated inputs is continuously analysed in the real-time operation of the device. The registration of the state change at an input is signalled by a brief flash of the *STATUS* diode. Analysis of inputs can be blocked (or unblocked) by the automation or remote control.

Outputs status is initially determined by the configuration in the device memory and set immediately after turning on the device. The status of each can be changed temporarily (during uninterrupted operation), permanently (remote reconfiguration) or interim through the automation or remote control via SMS or CLIP. Each output can be assigned a name in the memory, which enhances the functionality of remote SMS control.

Automation of setting outputs on and off, and (un)blocking inputs allows to personalise the operation of the device, as well as its peripherals. By employing a fully configurable scheme of logic functions (8 profiles with 8 arguments for 45 elements) and timing functions (8 timers with the selection of time, days of the week and months) for setting inputs and outputs, LMD-GSM Sealbox can be used to automate the intelligent operation of buildings, factories and other external devices. Optional ability to perform real-time automation, starting from the first initialisation of the device.

Executing functions of automation (6 functions with 8 results for 33 elements) enable simultaneous triggering of the input messages buffering, (un)blocking inputs, setting outputs on and off, and other functionalities via remote SMS control, authorising incoming calls, or locally when a selected input reaction is detected. Each executing function has a configurable scheme in the device memory, and can be used to directly and immediately manipulate the main aspects of the functionality of the device as a system of notification and control.

Device can be configured to perform actions as a response to incoming calls. They are detected in real time, their validation and handling takes precedence over sending messages. All incoming CLIP connection to the phone number of used micro SIM card are automatically discarded (ignored – GSM busy) upon detection, making this remote control toll-free. Only the numbers from the list (declared in the memory) and belonging to given groups are authorised during the validation. Unknown numbers (not on the list) may be optionally authorised as users of 8<sup>th</sup> group. Ability to send the status SMS, send the status of inputs and outputs, trigger executing functions of automation, control outputs state (according to a fully configurable scheme for all the groups) in response to an authorised incoming call.

Optionally, the authorisation of incoming calls may be configured to take into account a given timeframe defined by the timing functions for each group. Similar functionality is available for the generation of input messages.

Device monitors the stability of the GSM network signal, detecting a potential jamming which can be used as an element for the configuration of the automation's logic functions.

Presence of new SMS messages on the micro SIM card is detected in real time, and additionally checked with the frequency of 1 minute in the unlikely case of not catching the designated GSM notification. After the detection and the analysis of content, the device automatically removes them from the internal memory of the micro SIM card. The functionality of one-way SMS gateway enables sending unrecognised messages to the given phone number (1<sup>st</sup> one on the list), relaying the sender's information and the content.

Device automatically detects and corrects any configuration glitches caused by unfortunate use of the programming interface or remote SMS control commands. Should a functional event be enabled and set to send SMS / SMTP messages to users with no message content provided, the device will automatically send messages describing the name of the given event.

Functionality of periodical logging of temperature and relative humidity measurements, every selected time interval, allows for the local monitoring and analysis of the atmospheric and technical conditions of the environment.

Device can be used for the telemetry via GPRS. Functionality of periodic buffering (either interval of hours or daily at hour) sending of email messages (SMTP) with a full report of the latest logs with saved temperature and relative humidity measurements, optionally with the timestamp of each. Moreover, the full logs report (last 400 logs at the time of sending) can be configured to be sent as well, as an email attachment that can be read and interpreted by the programming interface.

LED diodes (two-colour *PWR* diode, and single-colour *GSM* and *STATUS* diodes) inform in real time about the current status of the GSM module and if it is performing any action. The also notify about occurring events, as well as received SMS messages and on-going remote control via SMS or CLIP.

Device supports two languages for the communication: Polish and English. Programming the device via the interface in the selected language automatically decides in which language it is to communicate. Language localisation includes the personalised status messages, event names and other.

## Transmission test

Transmission test event are used for a periodic testing of the device by the means of SMS / CLIP / GPRS messages in order to ensure its proper operation.

Test messages can be sent to selected users every fixed interval (0-240 hours) or daily at a specific hour (00:00 – 23:59, starting from the next day after the first initialisation). It is possible to send SMS / GPRS messages with the full status of the device instead of the content stored in the memory.

Enabling the transmission test with the value of 0 for the fixed interval type of periodical buffering causes messages being sent only as a result of an executing function of automation. Buffering of a transmission test event triggered by an executing function does not cause a reset of the countdown for the interval buffering, or scheduling for the next day in case of the daily buffering.

## Power supply

Device monitors the state of both AC/DC main power supply and VBAT lithium-polymer battery supply in real time, and optionally can buffer and send messages to selected users in the event of irregularities being detected.

In case of detecting a low battery charge (approximately 3.4V DC), the VBAT low level event is immediately buffered and repeated if the low state continuously persists in the selected time interval (0-1000 minutes).

Due to the hardware design of the battery charging circuit, the low level of battery cannot be detected when the AC/DC main supply is present.

AC/DC main power supply events are buffered when a state change is detected. Event for the persistent power shortage is buffered when the state persists continuously for the selected time interval (0-1000 minutes). Event for the power return, however, is buffered immediately after a stable power source is detected, and only when the shortage event has been in effect.

Buffering messages for both power supplies' events can be disabled by configuring the time intervals with the value of 0.

## Sensor of temperature and meter of humidity

Sensor of temperature allows constant monitoring of the ambient temperature in Celsius. Having detected exceeding one of 2 thresholds (Sensor H – high threshold, Sensor L – low threshold), the device immediately buffers the event and then notifies selected users via SMS and/or SMTP.

**Sensor H** event detects high ambient temperatures. The event is buffered when a higher temperature than its selected threshold is detected (ambient temperature > temperature of Sensor H), sending a single message to all the selected users. Device memorises the last event that occurred on the sensor – it will not buffer and send the message again until a temperature lower than or equal to that selected for Sensor H has been detected.

**Sensor L** event detects low ambient temperatures. The event is buffered when a lower temperature than its selected threshold is detected (ambient temperature < temperature of Sensor L), sending a single message to all the selected users. Device memorises the last event that occurred on the sensor – it will not buffer and send the message again until a temperature higher than or equal to that selected for Sensor L has been detected

Meter of humidity allows constant monitoring of the relative humidity. As in the case of the sensor of temperature, having detected exceeding one of 2 thresholds (Meter H – high threshold, Meter L – low threshold), the device immediately buffers the event and then notifies selected users via SMS and/or SMTP.

**Meter H** event detects high air humidity. The event is buffered when a higher relative humidity than its selected threshold is detected (ambient humidity > humidity of Meter H), sending a single message to all the selected users. Device memorises the last event that occurred on the meter – it will not buffer and send the message again until a relative humidity lower than or equal to that selected for Meter H has been detected.

**Meter L** event detects low air humidity. The event is buffered when a lower relative humidity than its selected threshold is detected (ambient humidity < humidity of Meter L), sending a single message to all the selected users. Device memorises the last event that occurred on the meter – it will not buffer and send the message again until a relative humidity higher than or equal to that selected for Meter L has been detected.

Both sensor of temperature and meter of humidity functionalities take measurements at the frequency of 60 seconds to ensure stable operation and notification. When comparing temperature measurements, the fractional part is not taken into account (ergo forced threshold of 1 Celsius).

Measuring the ambient temperature takes place only when the functionality of the sensor is enabled, and the ambient humidity – when the meter is enabled. Both functionalities requires the presence of the temperature & humidity measurer connected to the device.

The status of both events of the sensor and meter can be used to automate inputs and outputs as one of the arguments, as well as the presence of the temperature & humidity measurer.

Functionality of periodical logging of the temperature and relative humidity measurements at selected time intervals allows for the monitoring and analysis of the ambient atmospheric conditions (*local*). Telemetry via GPRS offers periodic reporting of the saved measurements at selected time intervals (*remote*).

## Digital opto-isolated inputs

Device offers continuous analysis of 3 digital (binary) opto-isolated inputs in real time, which can react upon detecting the change of polarity being triggered for a selected time interval (in milliseconds, with the resolution of 10ms) and, as a result, buffer the input SMS / CLIP / SMTP messages.

Input polarity is monitored without interruption, starting from the moment of the device's initialisation, and regardless of the device operation (*in parallel with any action*), detecting the polarisation changes (reactions) and registering (buffering) corresponding events, which can send messages to the selected users.

Opto-isolated inputs allow to connect wiring for either direct or alternating voltage in the range of 0-24V. In case of DC, the direction of the current flow is marked on the device's layout of components and connectors. However, each input must have the type of voltage it is to detect set via the programming interface – each type needs different software logic for detecting the presence, and is not automatically detected.

Hardware voltage on non-energised inputs, after turning on the device, is 0V – low state (*LOW*). The transition threshold for the detection of high state (*HIGH*) starts from approximately 5V.

Default (initial) state of polarity of each input, after turning on the device, is registered in accordance with the configuration in the device memory. The continuous analysis starts immediately after the first initialisation of the device. The breach of polarity and return to default reactions (*followed by buffering events*) are being registered as a result. For the initial HIGH polarity, the breach is registered for LOW polarity reaction, while for the initial LOW polarity, the breach is registered for HIGH polarity reaction.

Detection of a reaction (breach or return) is triggered after the selected time, declared separately for both changes on each input. The device continuously detects the momentary (instantaneous) change of state (HIGH or LOW) on an input and counts how long this momentary change persists. If the calculated time is equal or higher than the configured delay (time for triggering) for the given change of polarity, the device then registers a state change for either a breach or return (*in accordance with the current registered state, which is relative to the configured default polarity*), and buffers the corresponding event from which messages can be sent to the selected users.

In case of momentary spikes or deviations, the counter of the elapsed time (in milliseconds) is reset. The momentary state change (*which is opposite to the last registered polarity*) must remain completely stable for the given triggering time in order to register the change of polarity.

Option to cancel sending SMS / SMTP messages for a given change of polarity on a given input by leaving an empty message content field during the programming via the interface. The continuous analysis of the input will still take place, the polarity changes registered and events buffered, only the messages will not be sent in the end.

Device offers a functionality of **temporary blocking** of given inputs, and consequently unblocking via remote SMS control or local automation. Blocking an input causes temporary exclusion from the continuous analysis of inputs in real time and registering changes, while retaining its polarity state before the blockage (pause effect). Unblocking fully restores its state and continuous analysis.

Polarisation state of inputs can be checked via remote SMS control or the programming interface.

Possibility of local triggering of selected executing functions which, in essence, execute instantaneous one-shot automation according to the configured scheme when the selected changes of polarity are registered. The scheme allows to choose which automation results are to be called at a given input for a given polarisation change (*immediately when it occurs*). All schemes should be configured with caution, due to the inputs being analysed in real time – in theory, the automation should occur as fast as possible in order not to disturb the main aspects of the device's operation. Although almost instant, each automation executed as a result of the polarity change will extend the time needed for the state analysis of a single input. Those additional few milliseconds are not much of an issue for a regular operation, but it should be taken into account if the continuous analysis is to be extremely time-sensitive.

## Outputs

Device offers control of 4 outputs (*2 monostable relays and 2 of OC type*), enabling management of external devices.

Initial state of outputs is set in accordance with the configuration in the device memory during the first initialisation. The state can be checked or change remote SMS (sent commands) or CLIP (toll-free rejected incoming calls) control.

By default, the state of outputs is changed for the duration of an uninterrupted operation of the device – reset of the device restores the initial configuration. Remote control and automation do not change the configuration of the initial state in the device memory.

Permanent configuration of outputs in the device memory is possible via either the programming interface, or the remote SMS command which can simultaneously change the status of all outputs and change the configuration in the device memory.

Possibility to declare a custom name for each output in the device memory via the programming interface, which allows the functionality of controlling outputs by providing a name in a specific remote SMS command. Additionally, each output can be set interim on for a selected period programmed in the device memory, and counted in real time – after the countdown is over, the output will be immediately set off, regardless of any action being conducted by the device (e.g. sending a message).

Automation (*with logic and timing functions*) of a given output sets its state according to a programmed algorithm scheme, and takes precedence over any other form of internal control. Possibility to make the state of output dependent on the state of inputs, sensors, meters, technical events, signal stability, time and date, and more. Moreover, the state of outputs can be changed by the executing functions of automation, which can be triggered remotely (SMS or CLIP) or locally (immediately after detecting reactions on inputs).

## Groups

All users (*telephone numbers*) managed by the device are assigned to one of 8 groups. Each group offers a complete configuration scheme for handling technical and input messages (SMS / CLIP / SMTP) generated by the buffered events.

All configured events that occur are then stored in internal buffers (*queues in essence*) so that they can be sequentially serviced during the device operation, generating and sending messages to 500 users one by one. During a single full messaging sequence, the device checks in turn to which group each user (*out of all*) belongs and determines whether the type of a given message is configured to be sent – a message from a specific input or a technical event. If the message was selected to be sent for a given group, the transmission takes place, otherwise it

keeps seeking a valid user (*until all users were checked, which removes the event from the given buffer*). Each GSM transmission (*whether successful or not – numbers of tries are configured via the programming interface*) ends a sequence, until it is picked up again by the device operation. Separate sequences for SMS, CLIP and GPRS events.

Transmission of **input messages** for a given group can be additionally limited by a schedule defined by the timing functions called Timers (more about them in the chapter titled “Automation: arguments, timers and logic functions”), a schedule which, in technical terms, selects a mathematical union of sets bound by picked Timers, therefore determining time and date constraints. Overall, it can be controlled at what specific time(s) and date(s) messages generated by inputs can be sent.

If enabled for a given group, the schedule (Timer limitations) take precedence over the actual transmission, removing events from the buffers if the sending attempt occurs at the time and date that is not validated by the schedule for a given group (*if no picked Timer is active at the current time and date*). Option to select up to 8 configurable Timers to determine a schedule for each group. Not selecting any Timer is, as a result, equivalent to the resignation from sending input messages.

**Incoming calls** are detected in real time during the device operation. Their handling (authorisation) take precedence over servicing of buffers – no messages will be sent until the incoming CLIP connection to the micro SIM card is analysed (*naturally, if there is any on-going message transmission, it has to be finished until the incoming call analysis may occur*).

Analysis of incoming calls involves retrieving the number of the caller, immediately rejecting the call (*transmitting a busy GSM status as the reason*) and validating the caller as a user – whether the number should be authorised or not. For authorised users (*numbers stored on the phone list in the device memory*), the possibility to configure which actions are to take place such as the outputs control, or triggering of executing functions of automation, all in accordance with the scheme for a given group to which the user belongs. Optionally, it can be enabled that all unrecognised numbers (*not found on the list*) are automatically authorised as users of the 8<sup>th</sup> group.

Concerning the outputs control, their setting occurs immediately after the incoming call is analysed. It is possible to determine, via the programming interface, if and how an incoming call from a user belonging to a given group is to control (set) individual outputs:

Outputs control	Description
<b>X</b>	No action
<b>Off</b>	Setting off the output
<b>On</b>	Setting on the output
<b>On/Off</b>	Setting opposite state (relative to the current one) of the output
<b>Interim on</b>	Setting interim on of the output for a declared time

In addition to the outputs controls by authorising the user belonging to a given group, it is also possible to select which executing functions of automation are to be triggered. They will be handled simultaneously with the outputs control (if any) as a result of the incoming call.

Supporting both functionalities as a result the incoming call (*in essence, toll-free remote CLIP control*) can also be limited by a schedule defined by Timers, the timing functions – in the same way as described for the input messages. When enabled, the analysis of incoming calls also includes the validation of the schedule as the last step of the authorisation – if at least one of the picked Timers for a given group (*which is known if the caller’s number is found on the list in the device memory*) is active at the time of analysis.

## GPRS: SMTP protocol

LMD-GSM Sealbox offers full support for transmitting GPRS messages in the form of sending an email to the selected recipient address by employing the SMTP protocol.

Device establishes a permanent GPRS connection in order to guarantee a quick sending operation. SIM card with a static IP address is not required, at the GPRS status is constantly supervised and renewed in case of a connection loss.

Security of SMTP transmission can be ensured by the optional SSL encryption.

Buffering of GPRS messages depends on the proper configuration of GSM work mode (*one which establishes GPRS connection*), GPRS and SMTP email account, analysis on inputs, and technical events, therefore it should be conducted meticulously via the programming interface.

Sending messages via SMTP protocol from the buffer depends on the configuration of the group to which the sender is assigned. The configuration of the selected sender group dictates which input and technical messages are to be sent. More in the chapter titled "Groups".

Support for SSL encryption allows for safe and easy use of any email account in the world. In practical application, the account to which messages will be sent can be configured to forward messages to many recipients. In the era of smartphones that enable real-time synchronisation of email inboxes in any place in the world, multiple users can receive a message in an instant for the transmission cost of one message for the device's SIM card tariff.

**SMS messages can be fully replaced with email messages.**

Status of the GPRS connection is constantly monitored by the device at a frequency programmed via interface. If any irregularities are detected, steps to (re)establish a stable connection are taken immediately, guaranteeing a smooth operation of the device. The intelligent GPRS transmission algorithm examines the status of sent messages, repeating attempts if necessary. Additionally, the limit of email messages can be configured within a fixed time interval (12 hours). A specific value of the limit (-1) can also be configured in order to restrict sending GPRS messages only for the **telemetry reports** – so that no input or technical messages are to be sent.

Remote SMS control allows full reconfiguration of the GSM work mode and SMTP email account during the device operation.

## Telemetry of temperature

Functionality of the telemetry of temperature allows for periodical sending of logged temperature measurements via email with the SMTP protocol.

Telemetry message contains a full report of the last saved temperatures in logs, each optionally with a timestamp (in DD-MM-YY HH:MM format). Possibility to send a telemetry report every fixed interval (1-240 hours) or daily at a specific hour (00:00 – 23:59, starting from the next day after the first initialisation).

Temperature measurements, just as they are saved in the logs, are given in Celsius scale with a precision of decimal values.

In order to function properly, it is required to enable the functionality of the sensor of temperature, as well as saving the temperature measurements in logs every selected number of seconds. Otherwise, the device will automatically detect a conflict of action and block the telemetry of temperature.

Telemetry works on the principle of analysing saved temperature logs, starting with the log identification number which was the current one immediately after the first initialisation of the device (*or enabling telemetry of temperature via remote SMS control*), and ending with the log identification number current at the moment of performing the telemetry event. The device selects all the temperature logs within the defined range (*of logs identifications*) and generates a readable report as the content (*not as an attachment file*) of an email message. Having successfully sent the telemetry message, the device updates the log identification number with which the next telemetry report should start.



Since the number of logs the device memory can retain is finite, the occurrence of a situation in which the log memory register was shifted (to the beginning) is properly handled (*by shifting the logs range*) – in order to keep the continuity of analysis.

While the configuration of the sensor of temperature, frequency of temperature logging and period of sending the telemetry is the responsibility of the device's owner, the limits of the device memory should be minded in order to ensure a stable and reliable operation – too frequent logging of the temperature measurements may cause several shifts of the log memory register until the device attempts to send a telemetry message, which will affect the reliability of the report. The GSM module allows sending emails with a very long content, but a large number of characters may extend the email sending time.

## Telemetry of humidity

Functionality of the telemetry of humidity allows for periodical sending of logged relative humidity measurements via email with the SMTP protocol.

Telemetry message contains a full report of the last saved humidity in logs, each optionally with a timestamp (in DD-MM-YY HH:MM format). Possibility to send a telemetry report every fixed interval (1-240 hours) or daily at a specific hour (00:00 – 23:59, starting from the next day after the first initialisation).

Relative humidity measurements, just as they are saved in the logs, are given as a percentage.

In order to function properly, it is required to enable the functionality of the meter of humidity, as well as saving the relative humidity measurements in logs every selected number of seconds. Otherwise, the device will automatically detect a conflict of action and block the telemetry of humidity.

From a technical point of view, the telemetry of humidity operates on the same principle as the telemetry of temperature, with the same potential pitfalls (the shifting of the log memory register).

## Logs report

Functionality of the logs report (telemetry) allows for periodical sending of all the latest 400 logs via email with the SMTP protocol.

Possibility to send a logs report every fixed interval (1-240 hours) or daily at a specific hour (00:00 – 23:59, starting from the next day after the first initialisation).

Unlike the telemetry of temperature and humidity, the logs report is not send as the content of an email message, nor does it start from any log identification saved after the first initialisation of the device. An email attachment is generated, containing the latest 400 logs at the time of performing the event. The attachment can be read (imported) via the programming interface, which interprets the logs with a human-friendly descriptions in a given language.

## Automation

Scheme configuration (*called a profile*) is based on a mathematical model of a combinational system, using basic logic functions (AND, NAND, OR, NOR, XOR, NOT) and states of the device as arguments (inputs state, outputs state, Sensors state, Meters state, technical states, on-going events, timing functions etc.). Their results are continuously determined, and are responsible for directly controlling the setting of outputs, blocking inputs and setting variables.

When setting outputs on and off as a result of the automation profiles, the device internally uses the same mechanism as the remote SMS / CLIP control does. In effect, an instantaneous change of the state basing on the result (evaluation) of a given logic function for the selected arguments. Evaluation which happens continuously (*by default when the device is idling i.e. not actively using the GSM module*). Therefore, when a given output is subject to the automation process, its remote control is practically futile, given that the automation sets it anyway as soon as possible.

Automation can be configured to operate in real time – simultaneously with the continuous analysis of inputs, which occurs in parallel with any action taken by the device without interruption since the first initialisation.

Executing functions of automation can be used to control the device in an elaborate fashion remotely via SMS commands and incoming calls, or locally upon detecting a change of polarity (reaction) on the inputs. Possibility to configure 6 executing function schemes, each with the possibility to trigger 8 different results. Additionally, a scheme to declare which executing functions should be run for the incoming calls and a change of polarity on the inputs.

Triggering the executing functions allows immediate and direct manipulation of the main aspects of the device operations as a system of notification and control. For example, one incoming call from an authorised user can directly buffer an input message for a specific polarisation change from several inputs (*bypassing the continuous analysis – a message will be buffered despite no registration of polarisation change, or even a momentary polarisation change*), and simultaneously control external devices by setting the state of outputs. **Effectively, the device can work as a multitask SMS / CLIP / GPRS message gateway.** Messages from configured inputs can be buffered remotely, not locally by the continuous analysis of the wiring and the state.

## Automation: executing functions

Executing function of automation allows to configure the scheme with 8 different results to be directly triggered. All the selected results are triggered subsequently, from the first to last. The triggering occurs directly, there is no validation of the device status and configuration (corresponding to the result). It should be noted, however, that when, for instance, the device tries to send an input message for an unconfigured input (*i.e. no polarity set*) from the buffer, the internal handling of unexpected errors will detect that (*an occurrence of a buffered input message from a disabled input is considered an operation error*) and remove the event from the given buffer. Transmission test or logs report must also be enabled and properly configured for the buffer handling algorithm to try and send a message.

The following table shows description of all results:

Result	Description
<b>X</b>	No effect
<b>In1÷3: Breach</b>	Direct buffering of the polarisation breach event for the given input
<b>In1÷3: Return</b>	Direct buffering of the polarisation return to default event for the given input
<b>Out1÷4: Off</b>	Setting off the given output
<b>Out1÷4: On</b>	Setting on the given output
<b>Out1÷4: On/Off</b>	Setting opposite state (relative to the current one) of the given output
<b>Out1÷4: Interim on</b>	Setting interim on the given output
<b>In1÷3: Block</b>	Blocking the given input
<b>In1÷3: Unblock</b>	Unblocking the given input
<b>Clear SMS/SMTP limit</b>	Limit of SMS/SMTP messages is cleared, active limits are deactivated
<b>GSM refresh</b>	Triggering the sequence of refreshing the GSM module
<b>Airplane mode: On/Off</b>	Setting opposite state (relative to the current one) of the airplane mode
<b>Transmission test</b>	Direct buffering of the transmission test
<b>Logs report</b>	Direct buffering of the logs report

## Automation: arguments, timers and logic functions

Logic function returns one of two values: 1 (logical one – true) or 0 (logical zero – false) by logically evaluating selected arguments (logical variables).

Given output (*Out1÷4*) is set on if the logic function returns true for the given arguments, while set off if it returns false. Similarly for blocking (true) and unblocking (false) inputs (*In1÷3: B*). A result of the function may also set a variable (*Var1÷4*) of automation, which can be used as an argument for another logic function (*it should be noted that all the automation profiles are evaluated subsequently, starting from the 1<sup>st</sup> profile*).

Values of the arguments correspond to the following logical values:

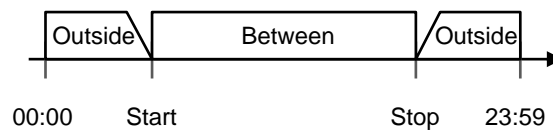
Argument	Description	Values of the argument
<b>1</b>	Logical one: true	1
<b>0</b>	Logical zero: false	0
<b>In1÷3: LOW</b>	Input state: registered LOW after the delay	1 – registered LOW on input 0 – registered HIGH on input
<b>In1÷3: HIGH</b>	Input state: registered HIGH after the delay	1 – registered HIGH on input 0 – registered LOW on input
<b>Sensor H</b>	Sensor H: high ambient temperature threshold	1 – ambient temp. > temp. Sensor H 0 – ambient temp. <= temp. Sensor H / none
<b>Sensor L</b>	Sensor L: low ambient temperature threshold	1 – ambient temp. < temp. Sensor L 0 – ambient temp. >= temp. Sensor L / none
<b>Meter H</b>	Meter H: high relative humidity (RH) threshold	1 – ambient RH > RH of Meter H 0 – ambient RH <= RH of Meter H / none
<b>Meter L</b>	Meter L: low relative humidity (RH) threshold	1 – ambient RH < RH of Meter L 0 – ambient RH >= RH of Meter L / none
<b>No measurer</b>	Temperature & humidity measurer not detected	1 – no measurer detected 0 – measurer detected
<b>No signal</b>	No signal or network registration	1 – no signal or network registration 0 – signal presence and network registration
<b>GSM failure</b>	GSM failure: no response from the module	1 – GSM failure 0 – no GSM failure
<b>AC/DC shortage</b>	Momentary shortage of AC/DC main power supply	1 – AC/DC main power supply shortage 0 – AC/DC main power supply presence
<b>VBAT low level</b>	Momentary low level of VBAT battery supply	1 – VBAT low level 0 – VBAT high level
<b>Jamming</b>	Jamming of the GSM network signal	1 – detected jamming 0 – no jamming
<b>No GPRS</b>	No active and established GPRS connection	1 – no GPRS connection / not active 0 – established and active GPRS
<b>SMS limit</b>	Active SMS limit for input messages	1 – active SMS limit 0 – inactive SMS limit / not set
<b>Email limit</b>	Active email limit for all messages	1 – active SMTP limit 0 – inactive SMTP limit / not set
<b>Airplane mode</b>	Airplane mode setting	1 – airplane mode on 0 – airplane mode off
<b>Clock failure</b>	No synchronisation of the clock with the time and date of the network operator	1 – no current date and time 0 – successful clock synchronisation
<b>Timer 1÷8</b>	Timing function	1 – Timer active for the date and time 0 – Timer inactive for the date and time
<b>Var1÷4</b>	Variable of automation	1 – variable set to true 0 – variable set to false
<b>Out1÷4</b>	Output state	1 – output set on 0 – output set off
<b>In1÷3: B</b>	Input blocking state	1 – input blocked 0 – input unblocked
<b>In1÷3: OK</b>	Input activity state	1 – input configured (enabled) and unblocked 0 – input not configured (disabled) or blocked

**Timer is active** when the time of the device clock is within the time range (interval) set by the Timer's operating mode (*between or outside*) and operates for the given day of the week and month; while **inactive** when it is not within the time range, does not function for the given day of the week or month, or is disabled (no operating option).

Day of the week is determined by the device basing on the current date of the internal clock.

For the „between” mode, Timer is active for the bounded closed set defined by the intersection of the selected start and stop time values (start time  $\leq$  the device time  $\leq$  stop time); while for the “outside” mode, active for the bounded open set defined by the complement (the device time  $<$  start time *OR* the device time  $>$  stop time).

Graphic diagrams of interval for the operating modes depending on the start and stop time values (HH:MM format):



Results returned by the functions correspond to the following Boolean algebra:

Function	Description	Number of args	Truth table		
<b>AND</b>	Logical conjunction  Logical operation returning true when <b>all</b> of its arguments have value of 1 (logical one)	Argument 1÷8	<i>Arg1</i>	<i>Arg2</i>	<i>Result</i>
			0	0	False
			0	1	False
			1	0	False
			1	1	True
<b>NAND</b>	Negation: logical conjunction  Logical operation returning true when <b>one</b> of its arguments has value of 0 (logical zero)	Argument 1÷8	<i>Arg1</i>	<i>Arg2</i>	<i>Result</i>
			0	0	True
			0	1	True
			1	0	True
			1	1	False
<b>OR</b>	Logical disjunction  Logical operation returning true when <b>one</b> of its arguments has value of 1 (logical one)	Argument 1÷8	<i>Arg1</i>	<i>Arg2</i>	<i>Result</i>
			0	0	False
			0	1	True
			1	0	True
			1	1	True
<b>NOR</b>	Negation: logical disjunction  Logical operation returning true when <b>all</b> of its arguments have value of 0 (logical zero)	Argument 1÷8	<i>Arg1</i>	<i>Arg2</i>	<i>Result</i>
			0	0	True
			0	1	False
			1	0	False
			1	1	False
<b>XOR</b>	Exclusive disjunction  Logical operation returning true when <b>odd total number</b> of its arguments have value of 1 (logical one)	Argument 1÷8	<i>Arg1</i>	<i>Arg2</i>	<i>Result</i>
			0	0	False
			0	1	True
			1	0	True
			1	1	False
<b>NOT</b>	Negation  Logical operation returning true when <b>the given</b> argument has value of 0 (logical zero)	Argument 1	<i>Arg1</i>	<i>Result</i>	
			0	True	
			1	False	

## Clock and logs

Internal clock of the GSM module, synchronised with the universal date and time provided by the network operator, allows for detailed logging of all activities performed by the device with an exact annotation of time. It is required to configure the GMT time zone for which the universal time is to be manipulated. Optionally, along with DST (CEST).

Synchronisation of the clock occurs during the first initialisation of the device. While all operators of GSM networks should provide the date and time to their subscribers almost immediately after a successful registration of the network, in case of the virtual operators there might be a slight delay. The default clock reading, before a successful synchronisation, is January 1, 2016, 00:00.

Possibility to set the clock remotely by providing the date and time via SMS command, or remotely triggering / locally configuring failsafe synchronisation via GPRS (NTP time server).

Supported functionality of determining the day of the week based on the current date.

The following details logs are recorded in the device memory:

- ✓ Initialisation of the device
- ✓ Change of polarity after delay on the input with the new registered polarity
- ✓ Direct buffering of an input message as a result of the executing function of automation
- ✓ Setting state of outputs (including the division into the remote control and automation)
- ✓ (Un)blocking of inputs (including the division into the remote control and automation)
- ✓ Sending message (including if successful or not) to a specific user belonging to a specific group
- ✓ Overflow (and the resulting flush) of the buffers
- ✓ Start and end of periodic events (AC/DC main power supply status, GSM failure, sensor of temperature, meter of humidity, transmission test, no network, SMS limit, SMTP limit, airplane mode, telemetry etc.)
- ✓ Authorised incoming calls from the users (including the description of the actions taken as a result)
- ✓ Schedule defined by Timers blocking a given action from occurring
- ✓ Signal stability (jamming, return of stable signal)
- ✓ Remote SMS control (including the description of the command and the authorised user data of sender)
- ✓ GPRS status (establishing connection, active connection or detection of connection loss)
- ✓ Periodical logging of the temperature in Celsius with a precision of decimal values
- ✓ Periodical logging of the relative humidity as a percentage
- ✓ Synchronisation of the clock with the network operator's date and time (including if successful or not)
- ✓ Refreshing GSM module
- ✓ Receiving new data from the programming interface

Up to 5500 logs can be read and written in the device memory. When the next identification of a log exceeds the total number of logs in memory, the device shifts the log memory register (*the log will have the identification number of 1*) and starts overwriting the previous logs.

Option to disable recording of logs about the state changes of inputs and outputs and the state of sending messages.

The programming interface „Programmer Link GSM Sealbox” offers reading and parsing logs from the device memory, and writing the read logs to a file in the format of Microsoft Excel Open XML Format Spreadsheet (XLSX), as well as their deletion. Moreover, the remotely sent (*as an email attachment via the logs report telemetry*) logs file can be imported in order to be parsed to human-friendly descriptions in a given language.

# Remote SMS control

LMD-GSM Sealbox offers the possibility of the remote control via SMS commands. In order to enable this functionality, it is required to program the device via the programming interface after providing the 5-character remote password. The device parses and executes commands from all the authorised users and, if the option is selected, only the ones belonging to the selected groups.

The syntax of each command with its respective argument(s) must be properly typed in a SMS addressed to the device's phone number, and preceded by the remote password. Otherwise (for incorrect syntax, missing parameters or typos) the command will be ignored.

Selecting the option "Confirm remote SMS control by the status message" via the interface will enable a one-time SMS reply containing the full status of the device (see the **info** command) only for commands that change the configuration; the reply will be sent directly to the telephone number from which a command was sent. If there is no answer for such a command, it means that the device rejected the remote control attempt (or is unresponsive for a given reason). Response to the other commands depend on their purpose (therefore, independent of the option).

Commands and their arguments must be typed in ASCII characters. Syntax of each command is case-insensitive (unlike the 5-character remote password). Their arguments, however, are case-sensitive. Only one command is accepted per SMS.

The device ignores (treats as an unrecognised message) commands which are either not preceded by the 5-character remote password, or providing a wrong password. It is imperative that the remote password, command and argument(s) are all separated by a single space – otherwise there is a parsing error and, therefore, the ignoring.

*For all the commands' examples, the following remote password is used: 12345*

Quick examples of valid remote SMS control commands:

12345 set 1101

12345 tel 120 +48600100200 5

12345 SENSORH 120

## Inputs and outputs status

Command allows to check the current polarisation status and the instantaneous status off all the digital opto-isolated inputs in the order from In1 to In3, and the status of all the outputs in order from Out1 to Out4. The response does not depend on the option of confirming the remote SMS control by the status message.

Syntax	Description	Example
<b>iostatus</b>	<p>SMS response with the status of all inputs and outputs in an orderly fashion</p> <p><i>Description of inputs' status:</i></p> <ul style="list-style-type: none"><li>1 – breach</li><li>0 – return (default)</li><li>X – disabled (off)</li><li>B – blocked</li></ul> <p><i>Description of outputs' status:</i></p> <ul style="list-style-type: none"><li>1 – on</li><li>0 – off</li><li>t – interim on</li></ul>	12345 iostatus

Note: the command informs about the registered state on the inputs after the given triggering time (breached or return polarity, relative to the default one) and on the instantaneous state (high or low state) for the active inputs. Moreover, the outputs, which may be set interim on for a given timespan and have an active countdown to be set off, are additionally marked as described above.

## Outputs setting

Command allows to set outputs on or off, either temporarily or permanently.

Syntax	Description	Example
<p><b>set <i>OUTPUTS SAVE</i></b></p> <p><i>outputs</i> – control of the outputs in orderly fashion (4 outputs)</p> <p><i>save</i> – save the given outputs configuration in the device memory (optional)</p>	<p>Setting on, off, opposite state, interim on, or ignoring the output</p> <p><u>Parametrisation of <i>outputs</i>:</u></p> <p>0 – off 1 – on 2 – on/off (opposite) 3 – interim on</p> <p><u>Parametrisation of <i>save</i>:</u></p> <p>1 – save in the device memory 0 or none – do not save</p>	<p>12345 set 1100</p> <p>12345 set 0123</p> <p>12345 set 1224</p> <p>12345 set 1aa0</p> <p>12345 set 1224 0</p> <p>12345 set 1224 1</p> <p>12345 set 1aa0 1</p>

By default, the command *temporarily* changes the configuration (namely outputs state) of the device; (remote, manual or unexpected) reset of the device results in the initialisation and setting the outputs according to the scheme programmed in the memory.

The optional *save* argument provides the ability to save the configuration of outputs permanently in the memory. After setting the outputs according to the *outputs* argument, the device then programmes the scheme of the outputs state in memory according to the given parametrisation – all the set on outputs as state-on in memory, and all the set off outputs as state-off in memory. Therefore, if the *save* argument is not provided, the state changes are temporarily.

Note: in case of providing unrecognised parameters in the *outputs* argument (it is required to provide parameters for all the outputs, in the order from Out1 to Out4), the device skips (ignores) changing the state of the given output (*12a0 sets on Out1, sets state of Out2 to the opposite, skips state change of Out3 and sets off Out4*).

## Output set on by name

Command allows to set on an output by providing its custom name.

Syntax	Description	Example
<p><b>on <i>NAME</i></b></p> <p><i>name</i> – of the output programmed in the device memory (up to 20 characters)</p>	<p>Set the output on by its name</p>	<p>12345 on output1</p> <p>12345 on aircondition</p> <p>12345 on oven</p>

Command changes the state of the output *temporarily* (until the reset of the device).

## Output set interim on by name

Command allows to set interim on an output by providing its custom name.

Time for the output to be temporarily set on is declared in the device memory, programmed via the interface. After its expiration, the output is instantly set off (regardless of a state change which may have occurred during the countdown).

Syntax	Description	Example
<b>ont <i>NAME</i></b>  <i>name – of the output programmed in the device memory (up to 20 characters)</i>	Set the output interim on by its name for the time declared in the device memory	12345 ont output2 12345 ont lock 12345 ont gate

Command changes the state of the output *temporarily* (until the reset of the device).

## Outputs setting off by name

Command allows to set off an output by providing its custom name.

Syntax	Description	Example
<b>off <i>NAME</i></b>  <i>name – of the output programmed in the device memory (up to 20 characters)</i>	Set the output off by its name	12345 off output3 12345 off lights 12345 off heating

Command changes the state of the output *temporarily* (until the reset of the device).

## Inputs blocking

Command allows to (un)block the continuous analysis of given inputs in the order from In1 to In3. Blocking causes the lack of registering polarisation changes and buffering corresponding events (with sending messages).

Syntax	Description	Example
<b>block <i>INPUTS</i></b>  <i>inputs – (un)blocking selected inputs (for 3 inputs)</i>	(Un)block inputs temporarily <u>Parametrisation of <i>inputs</i>:</u> 1 – block 0 – unblock	12345 block 101 12345 block 110 12345 block 10a

Command changes the state of the inputs *temporarily* (until the reset of the device).

Note: in case of providing unrecognised parameters in the *inputs* argument (it is required to provide parameters for all the inputs, in the order from In1 to In3), the device skips (ignores) (un)blocking of the given input (*10a blocks In1, unblocks In2 and skips the blocking state change of In3*).



## Inputs batch unblock

Command allows to unblock all the blocked inputs at once.

Syntax	Description	Example
<b>unblock</b>	Unblock all the blocked inputs	12345 unblock

Command changes the state of the inputs *temporarily* (until the reset of the device).

## Change phone number

Command changes the given phone number on the list permanently in the device memory.

Syntax	Description	Example
<p><b>tel X NUMBER GR</b></p> <p><i>x</i> – position on the list, 1 to 500</p> <p><i>number</i> – phone number in the international format, 0-16 characters</p> <p><i>gr</i> – group identification, 1 to 8</p>	<p>Change the phone number on the list</p> <p>International format indicates a plus sign followed by the number up to 15 characters</p> <p>Required to either provide both <i>number</i> and <i>gr</i> arguments, or none of them</p>	<p>12345 tel 1 +48600100200 1</p> <p>12345 tel 30 +48227124455 2</p> <p>12345 tel 432 +48600100200 7</p> <p>12345 tel 2</p> <p>12345 tel 65</p>

Note: the command is parsed and validated positively for either providing both *number* and *gr* arguments, or none of them. By not providing them, the user decides to clear the given phone number, meaning that no messages are to be sent to the given phone number on the list, even if the programmed schemes include that number position for various messaging events – ergo, remote blocking of all the messages sending for the given number.

## Change sending of notification messages to users

Command which permanently changes in the device memory the choice (scheme) of which events and inputs messages are to be sent for the given group of users.

Syntax	Description	Example
<p><b>send GR INPUTS EVENTS</b></p> <p><i>gr</i> – group identification, 1 to 8</p> <p><i>inputs</i> – choice of sending for inputs (In1 to In3 in orderly fashion, first for SMS/GPRS, then for CLIP), 6 characters</p> <p><i>events</i> – choice of sending for events (Test, CLIP Test, Sensor H/L, Meter H/L, AC/DC, VBAT in orderly fashion), 6 characters</p>	<p>Change sending of messages to a given group of users for a given type of notification (inputs and events)</p> <p><u>Parametrisation of <i>inputs</i> and <i>events</i>:</u></p> <p>1 – send 0 – do not send</p>	<p>12345 send 1 111000 111111</p> <p>12345 send 2 101010 101010</p> <p>12345 send 8 1abcde 123456</p>

Note: in case of providing unrecognised parameters in the *inputs* and/or *events* arguments (it is required to provide all the given number of parameters), the device skips (ignores) changing sending of notification messages for the given group of users.

For the *inputs* argument, first the new configuration of sending SMS / GPRS messages for the inputs ordered from In1 to In3 must be provided, then of sending CLIP messages from In1 to In3 – 6 parameters (characters) in total. The parametrised configurations must not be separated by a single space.

For the event argument, the new configuration of sending SMS / GPRS or CLIP messages for the events in orderly fashion (they are listed in the table above, and correspond to the order in the programming interface) must be provided – 6 parameters (characters) in total.

Example: `12345 send 3 110101 110101`

The command above will result in the reconfiguration of sending messages for the users of the 3<sup>rd</sup> group in the following way – inputs: send SMS / GPRS for In1 and In2, send CLIP for In1 and In3; events: send Test, send CLIP Test, send Meter H/L, send VBAT. For the remaining inputs and events (0 parameter), do not send.

## Change PIN code

Command changes the PIN code, used to unblock the SIM card, permanently in the device memory (does not affect the actual PIN code of the SIM card). Allows to quickly change the PIN code (before physically swapping the SIM card) in the memory without having to reprogram the device via the interface.

Syntax	Description	Example
<p><b>pin <i>NEW</i></b></p> <p><i>new – PIN code, 0 or 4 characters</i></p>	<p>Change PIN code in the device memory</p> <p>New PIN code must consist of either 0 (empty) or 4 characters</p>	<p>12345 pin 9876</p> <p>12345 pin</p>

## Change remote SMS password

Command changes the remote SMS password permanently in the device memory.

Syntax	Description	Example
<p><b>passwd <i>NEW</i></b></p> <p><i>new – password for remote SMS control, 5 characters</i></p>	<p>Change remote SMS password in the device memory</p> <p>New password cannot be empty</p> <p>No possibility to turn off the remote control by a SMS command</p>	<p>12345 passwd 12QwE</p> <p>12345 passwd 67890</p>

## Change option of sending unrecognised SMS messages to telephone T1

Command changes the setting of sending unrecognised SMS message to telephone T1 permanently in the device memory.

Syntax	Description	Example
<p><b>gateway <i>SETTING</i></b></p> <p><i>setting – choice of a one-way SMS gateway operation</i></p>	<p>Turn on or off the SMS gateway</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (send)</p> <p>0 – off (do not send)</p>	<p>12345 gateway 0</p> <p>12345 gateway 1</p>

## Change option of the airplane mode

Command changes the setting of the airplane mode status permanently in the device memory.

Syntax	Description	Example
<p><b>airplane <i>SETTING</i></b></p> <p><i>setting</i> – choice of an airplane mode operation</p>	<p>Turn on or off the airplane mode</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>0 – off 1 – on</p>	<p>12345 airplane 0</p> <p>12345 airplane 1</p>

Note: turning on the airplane mode remotely while the device is operational causes the clearing of all the buffers of events. The generated message that are awaiting delivery will be lost forever.

Airplane mode indicates resignation from sending SMS / CLIP / GPRS messages generated by the device during its operation. However, it does not affect the functionality of the remote SMS control (which may trigger a direct sending of custom messages) or incoming calls – the GSM modules stays turned on, the communication with the network operator remains active.

## Change configuration of the transmission test

Command changes the configuration of the transmission test permanently in the device memory. Ability to change the setting, type of periodic buffering and interval or hour time of buffering, all remotely.

Syntax	Description	Example
<p><b>test <i>SETTING TYPE TIME</i></b></p> <p><i>setting</i> – operating status of the transmission test</p> <p><i>type</i> – of periodic buffering, either interval of hours or daily at hour</p> <p><i>time</i> – interval (0 to 240 hours) or daily (between 00:00 and 23:59, format HHMM) time</p>	<p>Change the configuration of transmission test in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p> <p><u>Parametrisation of <i>type</i>:</u></p> <p>1 – daily buffering 0 – interval buffering</p>	<p>12345 test 1 0 0</p> <p>12345 test 1 0 12</p> <p>12345 test 1 0 240</p> <p>12345 test 1 1 0000</p> <p>12345 test 1 1 2359</p> <p>12345 test 0 0 0</p>

Time should correspond to the type – from 0 to 240 hours for the interval buffering, and between 00:00 and 23:59 (HHMM time formatting means two-digit hours and minutes in sequence, without a colon; 4 characters in total) for the daily one.

All arguments must be given even if the transmission test is to be disabled – otherwise the device will ignore the command (validation failure).

Note: in case of providing 0 as the parametrisation of both the *type* the *time* arguments, the device will buffer the transmission test event only when triggered by an executing function of automation. Should there be no programmed message content for SMS / GPRS, the device sends a default “Transmission test” message. Moreover, using this command will cause a reset of the countdown for the interval buffering, or scheduling for the next day in case of the daily buffering.

## Change configuration of the temperature sensor

Command changes the configuration of the temperature sensor permanently in memory.

Syntax	Description	Example
<p><b>sensor <i>SETTING</i></b></p> <p><i>setting</i> – temperature sensor enabled or disabled</p>	<p>Change the configuration of the temperature sensor in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p>	<p>12345 sensor 1 12345 sensor 0</p>

Note: in case of the lack of SMS / GPRS content message in the memory for Sensor H or Sensor L events, the device sends a default message (corresponding to the name of the event).

Configurations of Sensor H and Sensor L can be changed permanently in the memory with the following commands:

Syntax	Description	Example
<p><b>sensorh <i>TEMP</i></b></p> <p><i>temp</i> – temperature in Celsius (from -35 to 120C)</p>	<p>Change the configuration of the Sensor H event (threshold)</p>	<p>12345 sensorh -35 12345 sensorh 0 12345 sensorh 120</p>
Syntax	Description	Example
<p><b>sensorl <i>TEMP</i></b></p> <p><i>temp</i> – temperature in Celsius (from -35 to 120C)</p>	<p>Change the configuration of the Sensor L event (threshold)</p>	<p>12345 sensorl -5 12345 sensorl 1 12345 sensorl 35</p>

Note: the temperature (threshold) of triggering Sensor H should be greater or equal to that of Sensor L. Otherwise, it is possible that both events may be registered as positive for one temperature value.

## Change configuration of the periodical temperature logging

Command changes the configuration of the periodical temperature logging and the interval between each triggering.

Syntax	Description	Example
<p><b>logtemp <i>SETTING INTERVAL</i></b></p> <p><i>setting</i> – temperature logging enabled or disabled</p> <p><i>interval</i> – between logging each measurement (60 to 60000 seconds)</p>	<p>Change the configuration of the temperature logging functionality</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – save temperature in logs 0 – do not save</p>	<p>12345 logtemp 1 60 12345 logtemp 1 3600 12345 logtemp 1 60000 12345 logtemp 0 60</p>

Changing the configuration of the periodical temperature logging does not modify in any way the configuration of the temperature sensor and its thresholds. Sensor of temperature must be enabled and configured for the functionality of temperature logging to be operational.

## Change configuration of the humidity meter

Command changes the configuration of the humidity meter permanently in memory.

Syntax	Description	Example
<p><b>meter <i>SETTING</i></b></p> <p><i>setting – humidity meter enabled or disabled</i></p>	<p>Change the configuration of the humidity meter in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p>	<p>12345 meter 1 12345 meter 0</p>

Note: in case of the lack of SMS / GPRS content message in the memory for Meter H or Meter L events, the device sends a default message (corresponding to the name of the event).

Configurations of Meter H and Meter L can be changed permanently in the memory with the following commands:

Syntax	Description	Example
<p><b>meterh <i>RH</i></b></p> <p><i>rh – relative humidity as a percentage (from 1 to 99%)</i></p>	<p>Change the configuration of the Meter H event (threshold)</p>	<p>12345 meterh 1 12345 meterh 20 12345 meterh 99</p>
Syntax	Description	Example
<p><b>meterl <i>RH</i></b></p> <p><i>rh – relative humidity as a percentage (from 1 to 99%)</i></p>	<p>Change the configuration of the Meter L event (threshold)</p>	<p>12345 meterl 5 12345 meterl 45 12345 meterl 80</p>

Note: the relative humidity (threshold) of triggering Meter H should be greater or equal to that of Meter L. Otherwise, it is possible that both events may be registered as positive for one relative humidity value.

## Change configuration of the periodical humidity logging

Command changes the configuration of the periodical humidity logging and the interval between each triggering.

Syntax	Description	Example
<p><b>logrh <i>SETTING INTERVAL</i></b></p> <p><i>setting – humidity logging enabled or disabled</i></p> <p><i>interval – between logging each measurement (60 to 60000 seconds)</i></p>	<p>Change the configuration of the humidity logging functionality</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – save humidity in logs 0 – do not save</p>	<p>12345 logrh 1 60 12345 logrh 1 3600 12345 logrh 1 60000 12345 logrh 0 60</p>

Changing the configuration of the periodical humidity logging does not modify in any way the configuration of the humidity meter and its thresholds. Meter of humidity must be enabled and configured for the functionality of humidity logging to be operational.

## Change date, time and zone of the clock

Command changes temporarily (until the device reset) the date and time of the device clock, and permanently reconfigures the GMT zone and DST (according to CEST) settings for correct time manipulation.

Syntax	Description	Example
<p><b>clock DATE TIME GMT DST</b></p> <p><i>date</i> – in DDMMYY format</p> <p><i>time</i> – in HHMM format</p> <p><i>gmt</i> – time zone</p> <p><i>dst</i> – Daylight Saving Time</p>	<p>Change the date and time of the device clock, and GMT and DST settings for the time manipulation</p> <p><u>Parametrisation of dst:</u></p> <p>1 – turn on DST adjusting 0 – turn off</p>	<p>12345 clock 010101 0000 0 0</p> <p>12345 clock 010614 1200 2 1</p> <p>12345 clock 311299 2359 -11 1</p>

Upon the command execution, any events with the daily buffering will be automatically scheduled for the next day.

Note: date in DDMMYY formatting means two-digit for day, month and year in sequence. Time in HHMM formatting means two-digit hours and minutes in sequence, without a colon. Moreover, the minimal value of date is 01/01/2001 (010101), and the maximum is 31/12/2099 (311299). Time value – between 00:00 (0000) and 23:59 (2359). Both date and time should be provided as the universal time – for GMT+0 zone. GMT zone from -11 to 12.

## USSD codes

Command for the remote execution of USSD codes on a micro SIM card. The main application is to check the account balance, recharging and other services. The sender of the remote command will receive the response from the operator as a reply – only the immediate one. USSD services that send additional SMS messages as the response may be caught with the functionality of the SMS gateway.

Syntax	Description	Example
<p><b>ussd CODE</b></p> <p><i>code</i> – network command in USSD format, up to 35 characters</p>	<p>Perform USSD codes</p> <p>SMS reply with the immediate response from the network operator</p>	<p>12345 ussd *100#</p> <p>12345 ussd *124*#</p> <p>12345 ussd *123#14356743565484#</p>

USSD codes for checking the balance and validity, and recharging **prepaid** accounts for Polish networks:

Network operator	Balance and validity	Recharging
Plus	*100#	*123*telecode#
Orange	*124*#	*125*telecode#
T-Mobile	*101#	*111*telecode#
Play	*101#	*100*telecode#
Heyah	*108#	*109*telecode#
nju mobile	*127*1#	*128*telecode#
Lycamobile	*131#	*131*telecode#
Virgin Mobile	*101#	n/a

## Executing function of automation

Command triggers the executing function of automation for the declared scheme of operation.

Syntax	Description	Example
<p><b>exe X</b></p> <p><i>x – identification number of the executing function (1 to 6)</i></p>	Remote triggering of the given executing function of automation	<p>12345 exe 1</p> <p>12345 exe 2</p> <p>12345 exe 6</p>

## Synchronisation of the clock with the NTP server

Command allows to synchronise the date and time of the device clock via the Internet using the NTP protocol. Additionally, it allows for permanent reconfiguration of GMT zone and DST (according to CEST) in the device memory.

Syntax	Description	Example
<p><b>ntp GMT DST</b></p> <p><i>gmt – time zone</i></p> <p><i>dst – Daylight Saving Time</i></p>	<p>Synchronise the device clock with the time server NTP</p> <p><u>Parametrisation of dst:</u></p> <p>1 – turn on DST adjusting</p> <p>0 – turn off</p>	<p>12345 ntp 0 0</p> <p>12345 ntp 2 1</p> <p>12345 ntp -11 0</p>

Note: requires an active GPRS connection. If the current GSM work mode does not activate it, the connection is established temporarily (or at least attempted) in order to successfully get the time via the Internet. GMT zone from -11 to 12. The device receives the universal time from the time server NTP, which is then manipulated according to the GMT and DST settings.

## GSM work mode

Command changes the work mode of the GSM module permanently in the device memory.

Syntax	Description	Example
<p><b>mode CHOICE</b></p> <p><i>choice – of new work mode</i></p>	<p>Change GSM work mode</p> <p><u>Parametrisation of choice:</u></p> <p>0 – SMS+CLIP</p> <p>1 – GPRS</p> <p>2 – GPRS+SMS+CLIP</p> <p>3 – GPRS: SMS when GPRS failure</p>	<p>12345 mode 0</p> <p>12345 mode 1</p> <p>12345 mode 2</p> <p>12345 mode 3</p>

Note: when changing the work mode, the current GPRS connection (if active) will be terminated, and the settings will be reloaded quickly to ensure a smooth transition and the potential to establish a new connection.

## Change email recipient address

Command changes the email address of the GPRS (SMTP) messages' recipient permanently in the device memory.

Syntax	Description	Example
<p><b>recipient ADDRESS</b></p> <p><i>address – new for the email recipient, up to 35 characters (optional)</i></p>	<p>Change the recipient address for email messages</p>	<p>12345 recipient kontakt@linkdm.pl</p> <p>12345 recipient mm@linkdm.pl</p> <p>12345 recipient bot@linkdm.pl</p>

Note: not providing the *address* argument means that an empty address will be programmed in the device memory, being equivalent to disabling sending email messages.

## Change configuration of the temperature telemetry

Command changes the configuration of the temperature telemetry permanently in the device memory. Ability to change the settings, type of periodic buffering and the interval or hour time of buffering, all remotely.

Syntax	Description	Example
<p><b>telemetrytemp SETTING TYPE TIME</b></p> <p><i>setting – operating status of the temperature telemetry</i></p> <p><i>type – of periodic buffering, either interval of hours or daily at hour</i></p> <p><i>time – interval (1 to 240 hours) or daily (between 00:00 and 23:59, format HHMM) time</i></p>	<p>Change the configuration of temperature telemetry in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p> <p><u>Parametrisation of <i>type</i>:</u></p> <p>1 – daily buffering 0 – interval buffering</p>	<p>12345 telemetrytemp 1 0 1</p> <p>12345 telemetrytemp 1 0 12</p> <p>12345 telemetrytemp 1 0 240</p> <p>12345 telemetrytemp 1 1 0000</p> <p>12345 telemetrytemp 1 1 2359</p> <p>12345 telemetrytemp 0 0 1</p>

Time should correspond to the type – from 1 to 240 hours for the interval buffering, and between 00:00 and 23:59 (HHMM time formatting means two-digit hours and minutes in sequence, without a colon; 4 characters in total) for the daily one.

All arguments must be given even if the temperature telemetry is to be disabled – otherwise the device will ignore the command (validation failure).

Note: using this command will cause a reset of the countdown for the interval buffering, or scheduling for the next day in case of the daily buffering, for the event of temperature telemetry.



## Change configuration of the humidity telemetry

Command changes the configuration of the humidity telemetry permanently in the device memory. Ability to change the settings, type of periodic buffering and the interval or hour time of buffering, all remotely.

Syntax	Description	Example
<p><b>telemetryrh SETTING TYPE TIME</b></p> <p><i>setting</i> – operating status of the humidity telemetry</p> <p><i>type</i> – of periodic buffering, either interval of hours or daily at hour</p> <p><i>time</i> – interval (1 to 240 hours) or daily (between 00:00 and 23:59, format HHMM) time</p>	<p>Change the configuration of humidity telemetry in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p> <p><u>Parametrisation of <i>type</i>:</u></p> <p>1 – daily buffering 0 – interval buffering</p>	<p>12345 telemetryrh 1 0 1</p> <p>12345 telemetryrh 1 0 12</p> <p>12345 telemetryrh 1 0 240</p> <p>12345 telemetryrh 1 1 0000</p> <p>12345 telemetryrh 1 1 2359</p> <p>12345 telemetryrh 0 0 1</p>

Time should correspond to the type – from 1 to 240 hours for the interval buffering, and between 00:00 and 23:59 (HHMM time formatting means two-digit hours and minutes in sequence, without a colon; 4 characters in total) for the daily one.

All arguments must be given even if the humidity telemetry is to be disabled – otherwise the device will ignore the command (validation failure).

Note: using this command will cause a reset of the countdown for the interval buffering, or scheduling for the next day in case of the daily buffering, for the event of humidity telemetry.

## Change configuration of the logs report (telemetry)

Command changes the configuration of the logs report permanently in the device memory. Ability to change the settings, type of periodic buffering and the interval or hour time of buffering, all remotely.

Syntax	Description	Example
<p><b>telemetrylogs SETTING TYPE TIME</b></p> <p><i>setting</i> – operating status of the logs report</p> <p><i>type</i> – of periodic buffering, either interval of hours or daily at hour</p> <p><i>time</i> – interval (1 to 240 hours) or daily (between 00:00 and 23:59, format HHMM) time</p>	<p>Change the configuration of humidity telemetry in the memory</p> <p><u>Parametrisation of <i>setting</i>:</u></p> <p>1 – on (enabled) 0 – off (disabled)</p> <p><u>Parametrisation of <i>type</i>:</u></p> <p>1 – daily buffering 0 – interval buffering</p>	<p>12345 telemetrylogs 1 0 1</p> <p>12345 telemetrylogs 1 0 12</p> <p>12345 telemetrylogs 1 0 240</p> <p>12345 telemetrylogs 1 1 0000</p> <p>12345 telemetrylogs 1 1 2359</p> <p>12345 telemetrylogs 0 0 1</p>

Time should correspond to the type – from 1 to 240 hours for the interval buffering, and between 00:00 and 23:59 (HHMM time formatting means two-digit hours and minutes in sequence, without a colon; 4 characters in total) for the daily one.

All arguments must be given even if the logs report is to be disabled – otherwise the device will ignore the command (validation failure).

Note: using this command will cause a reset of the countdown for the interval buffering, or scheduling for the next day in case of the daily buffering, for the event of logs report.

## Send logs report

Command allows to remotely buffer the event of logs report.

Syntax	Description	Example
<b>logs</b>	Buffer the event of logs report	12345 logs

Note: requires active GPRS connection enabled by the proper GSM work mode, otherwise the event will be automatically discarded. Disregards the configuration of the logs report (telemetry) in the device memory – no countdown reset for interval buffering or scheduling the next day for daily buffering.

## Geolocate the device

Command sends an SMS response with the geolocation data of the device, namely latitude and longitude.

Syntax	Description	Example
<b>geoloc</b>	Geolocate the device	12345 geoloc

Note: requires active GPRS connection. If the current GSM work mode does not enable it, it is temporarily established for the duration of determining the geolocation. In case of failure to receive the geographical location information via GPRS, the command sends the list containing all the cell towers which are actively communicating with the GSM module – namely MCC, MNC, LAC and CID. Having this data, the user can perform manual triangulation of the geographical position, e.g. by employing the [cellidfinder.com](http://cellidfinder.com) web service.

It should be considered that the device does not have a GPS module, and the GSM localisation is performed by multilateration of radio signals and their strength between several cell towers, which only estimates the general location – accuracy issues. The latitude and longitude returned by the device is only for general localisation purposes, and not highly specific.

## Reset the device

Command performs the reset of the device and its GSM module. As a result, all temporary changes are discarded, and all states return to their default values (including inputs, outputs, events countdown etc.). In the unlikely event of failure, it tries to send a SMS message informing the user of a malfunction.

Syntax	Description	Example
<b>reset</b>	Reset the operation of the device	12345 reset

## Status of the device

Command sends an SMS response with the full status of the device.

Syntax	Description	Example
<b>info</b>	SMS reply with the full status: <ul style="list-style-type: none"> <li>– device name and software version</li> <li>– clock's date, time and day of week</li> <li>– operator name and signal strength               <ul style="list-style-type: none"> <li>– temperature</li> <li>– relative humidity</li> </ul> </li> <li>– AC/DC main supply state</li> <li>– VBAT battery supply state</li> <li>– total count of logs in memory               <ul style="list-style-type: none"> <li>– GPRS connection state</li> <li>– inputs' polarisation state                   <ul style="list-style-type: none"> <li>– outputs state</li> </ul> </li> </ul> </li> <li>– count of SMS messages from inputs, and SMTP messages</li> </ul>	12345 info
<b>Detailed description of the GPRS connection states for handling email via SMTP</b>		
<b>0</b>	GPRS: Deactivated by GSM module	
<b>7</b>	GPRS: Unexpected connection failure	
<b>8</b>	GPRS: No signal	
<b>9</b>	GPRS: Turned off	
<b>A</b>	GPRS: Connection established	
<b>B</b>	GPRS: Establishing connection	
<b>C/D</b>	GPRS: No connection	

Active airplane mode is indicated by **A** in the signal strength scale.

No detection of the temperature & humidity measurer or a disabled Sensor / Meter functionality is indicated by **X**.

Exceeding the high temperature / humidity threshold is indicated by **H** next to the measurement, and the low one by **L**.

Presence of AC/DC main supply is indicated by **OK**, and the shortage by **X**.

Low level of VBAT battery supply is indicated by **L**, and high one by **OK**.

Count of SMS messages is a sum of those sent as message generated by a reaction on the inputs within the configured limit of messages within 12 hours.

Count of SMTP messages is a sum of all, and is displayed after the count of SMS messages only for the GSM work mode with an active GPRS connection.

Exceeding any messages limit is indicated by the \* character next to the count value.

# Declaration of conformity no. 1/01/2016

*Declaration complies with the norm EN ISO/IEC 17050-1:2010*

**Manufacturer** LinkDM  
**Address** Generała Berlinga 5/43, 05-101 Nowy Dwór Mazowiecki  
**Product** LMD-GSM  
**Model** LMD-GSM Sealbox

Manufacturer declares that the product complies with the essential requirements for safety and health specified in the following EU directives:

<b>R&amp;TTE</b>	1999/5/EC
<b>EMC</b>	2004/108/EC
<b>LVD</b>	2006/95/EC

Manufacturer declares that the product complies with the following norms:

<b>Radio requirements</b>	ETSI EN 301 511 V9.0.2:2003
<b>Electromagnetic compatibility</b>	ETSI EN 301 489-1 V1.9.2:2011 ETSI EN 301 489-7 V1.3.1:2005 EN 61000-6-1:2007 EN 61000-6-3:2007
<b>Safety of use</b>	EN 60950-1:2006/AC:2011

Product includes GSM/GPRS module Fibocom G510 that meets the essential requirements of Article 10.5 of the R&TTE 1999/5/EC directive, which is used in the accordance with the intended use and the recommendations of the manufacturer, and has the CE 0700 mark. Manufacturer notes that the module is a subject of expert opinion No. 13-116436 issued by PHOENIX TESTLAB GmbH on 2<sup>nd</sup> January 2014.



Place of issue: Nowy Dwór Mazowiecki  
Date of issue: 1 January 2016

Full name: Dariusz Miklewicz  
Position: Owner

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