

MT-703

User Manual

MT-703 User Manual

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1 Designation of the module



The **MT-703** (or **MT-703 HC**) module is a specialized telemetry device. It is optimised for use in the simple measuring or alarm systems, which do not have network power supply.

The module features compact design and low energy consumption from integrated batteries. It is also capable of continuous counting of pulses on binary inputs, local logging of measuring results and spontaneous transmission of information in case of pre-defined alarm conditions. That's why this device may be used in many applications which require a periodical checking of parameters and a long term battery operation. The module is manufactured in two versions which differ in capacity of internal battery set (**MT-703** model with standard battery and **MT-703 HC** model with doubled battery capacity).

The typical range of applications of **MT-703** module are water-sewage systems, especially in measuring the water flow by means of water meters with potential-free contacts as well as monitoring the water level in reservoirs and wells.

We suggest that you should study the operating description and configuration of the **MT-703** module as well as the examples of applications and instructions regarding optimization of power consumption, given in the appendices.

2 GSM requirements

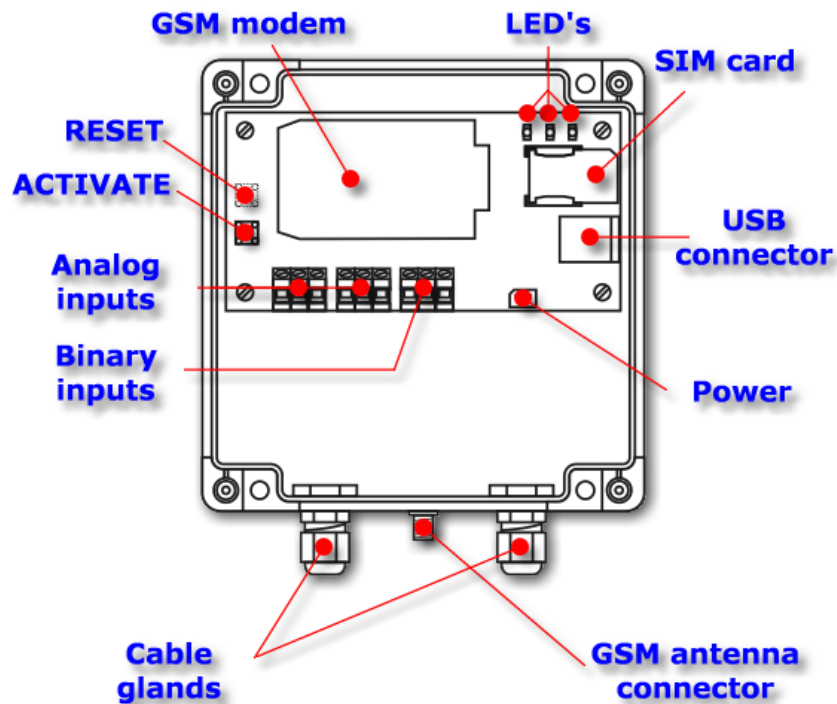
To ensure the proper operation of the telemetry module, it is necessary to use the properly configured SIM card. The card should be delivered by the GSM operator who provides the GPRS and/or SMS transmission services.

Except the capability of operation in GPRS mode, it is also necessary to register the card in an APN with static IP addressing. The unique IP address assigned to the SIM card will be the address identifier of the telemetry module in the APN. It enables the transmission to other telemetry modules and/or to the servers operating within the same APN structure.

It is absolutely necessary to ensure the proper GSM signal in the area where the module antenna is to be installed. Using the module in the places with poor GSM signal conditions may lead to the disturbances of the transmission as well as the loss of data, which increase operating costs as well.

3 Design of the module

3.1 Layout of MT-703 elements



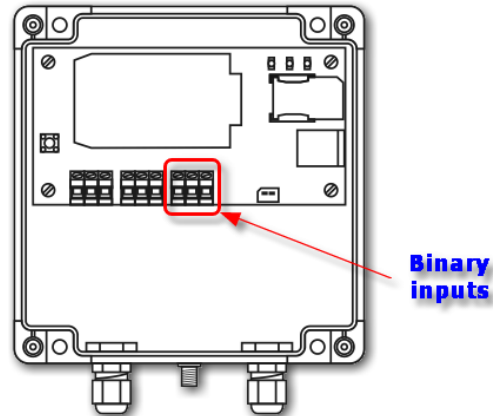
3.2 The resources

Hardware resources of the **MT-703** module

DI - binary inputs	2	- with counting and powering of potential-free contact capabilities
	1	- with alarm on opening the module cover
AI - analog inputs	2	- 0-3.3 VDC, with option of powering the measured circuit (3.3 VDC)

3.2.1 Binary inputs

The **MT-703** telemetry module has two general purpose binary inputs (**DI**) indicated as **I1**, **I2**, and one auxiliary binary input **I3**, which is factory connected with the cover opening sensor.



Because the operation of the **I3** input is factory fixed and it has no additional features we focus on the functionality of the inputs **I1**, **I2** only.

Both **I1**, **I2** inputs have identical features and are designed for use with potential-free contacts.

Basic features of the binary inputs are as follows:

- Non-isolated inputs with a common voltage supply
- Negative logic allowing energy saving
- Active inputs even in a standby mode of the module
- Capability of activating the module transmitter (module wake up)
- Pulse counting function which works seamlessly without module wake up

The inputs operate with contacts placed between input and ground connectors. Each input can be configured in one of three operation modes:

- Common binary mode. In this mode the input detects the close/open state of the contact. The state is detected only in case of wake up the module by Measuring timer and it is stored in the internal logger (if enabled). This is the basic mode of binary input operation.
- Alarm mode. Basically this mode differs from the common mode in an immediate detection of contact closing, which results in the immediate module wake up. Then the module runs the measuring cycle and process the rules. It ensures the asynchronous (i.e., independent on Measuring timer) transmission of alarm information. Neither the measured value nor the input activation event are stored in the internal logger. Additionally, neither the crossing of alarm thresholds on analog inputs nor the increments and alarm level crossing on totalizers are evaluated. Therefore in this mode the rules cannot be triggered by flags which are set for analog alarm levels and for value increments in the totalizers.
- Counter mode. Despite of the basic function this mode features pulse counting as well. Pulses are counted with different weights which are set by the user (1, 10, 100 or 1000). The non-volatile 32-bit wide register is used to count the pulses, providing the maximum count of 4,294,967,296 pulses. If the counting function is enabled, the difference between the previous and the current status of the totalizer can be calculated. This also gives the information about the totalizer content increment. If the counting function is active, it is also possible to enable two alarm levels, which create rules controlled by the levels themselves. As the consequence, the binary inputs allow easy flow monitoring if they are connected to pulse flow-meters.

You should notice the binary inputs are built in a way that enables the expansion of their functionality. It means the counting input may simultaneously work as an alarm input as well as a common binary input (if it has sense, of course).

The mode of input operation depends on its configuration.

See also:

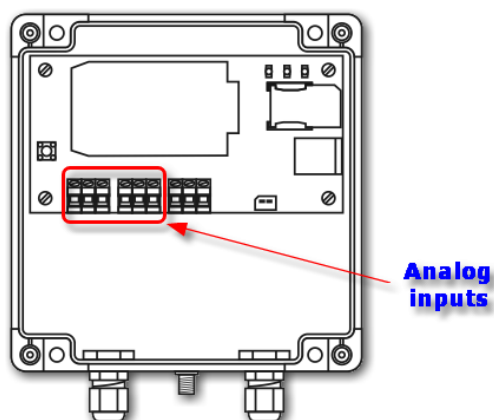
Setting binary inputs [29](#)

Technical data [47](#)

Connecting the binary inputs I1, I2 [12](#)

3.2.2 Analog inputs

The **MT-703** telemetry module has two analog inputs (**AI**) of voltage type marked as **AN1, AN2**.



The inputs operate in 0 - 3.3 VDC voltage range. They convert an analog signal from sensors powered by the 3.3 VDC voltages. These voltages are delivered by associated powering outputs. To save the energy the converters are powered only within a time period required for making a proper measurement.

The analog inputs of the module are not insulated. It has practically negligible influence on the interference immunity, because the module is battery supplied (i.e., it has a flowing potential).

Because the settling time of results on analog inputs is about 10 s, it means that the inputs are not suitable for high-speed signal measurements.

See also:

Setting analog inputs [31](#)

Technical data [47](#)

Connecting the analog inputs AN1, AN2 [12](#)

3.2.3 Timers

The **MT-703** telemetry module has two programmable timers used for different purposes.

The **Measuring timer (T1)** is used for metering the measurement cycles defined by switching the external sensors on/off. The sensors are powered from **Vcc** connectors. During the measurement cycle the following measurements are carried out:

- Testing the status of binary inputs
- Signal measurements on analog inputs
- Testing the alarms for analog inputs
- Measurement of the supply voltage
- Checking the low alarm for supply voltage
- Computing increments of the totalizers content (if enabled)
- Checking alarms for totalizers (if enabled)
- Setting the flags according to the current state of the device
- Processing the rules

After executing above operations the module returns to the stand-by mode.

The main purpose of the **Transmission timer (T2)** is metering the transmission cycles for sending the content of internal logger. The timer initializes the module wake up process, starts the data transmission and initializes the readout of signal values on the module inputs. However, the timer does not check alarms on the analog inputs.

The activity period of the module amounts up to 2 minutes. After this time, the module is obligatory put into stand-by mode. This means that when are troubles with SMS and data sending, it may happen that the configured rules are not be fully processed. For example, it may happen when there are several rules to be processed and each of them requires the transmission repetition. When the module has to send the content of the logger, the activity period is extended by 5 minutes.

The proper configuration of the timers enables the precise programming of the activity as well as stand-by cycles of the module. It helps to optimise the energy consumption, which is extremely important due to the extending the time of battery life.

3.2.4 The internal logger

The **MT-703** telemetry module is equipped with programmable logger which can collect up to 576 data records. This allows to store the 24 hours measurements, executed every 5 minutes. The measured data are entered to the register synchronously with the ticks of one of the module timers. All variable values marked for recording in the configuration are saved. Entries in the logger have a timestamp provided by the module real time clock (RTC). To achieve the coherence of recorded data it is recommended the RTC should operate in UTC time scale.

The data stored in the logger are transmitted to the IP address given in the configuration. The data receipt confirmation causes removing them from the logger memory.

Attention!
The recording function of the module is available only in GPRS transmission mode

3.2.5 Real time clock

The **MT-703** module has its own **Real Time Clock (RTC)**.

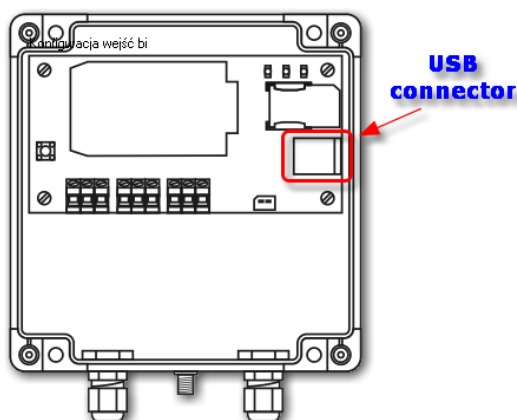
This clock provides time reference for the operating cycles of the device, for the timers as well as for setting timestamps in measurement results which are stored in the logger. Incorrect setting of the clock may result in faulty marking of the results, thus causes the possible loss of important data. That's why it is recommended to set the clock to UTC time, not to the local time zone.

Attention!
The setting of the real time clock must be updated if the module has not been powered for more than 2 minutes.

The method of RTC setting is described in documentation of the **MTM** program and in **MT Spooler** User Manual.

3.3 USB interface

The **USB** interface built inside the **MT-703** module is used for the connecting a computer during the local configuration of the module.

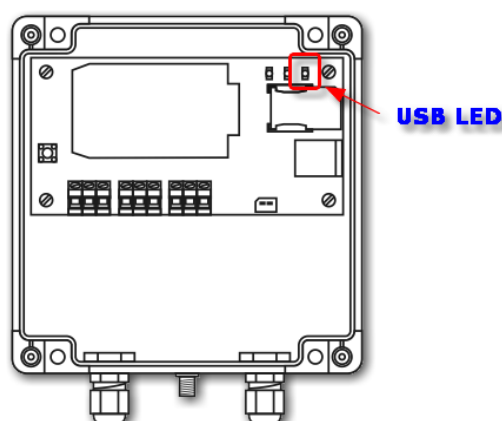


Because the USB standard provides a possibility of powering the devices connected to the USB port from the host computer, such mode is also possible in this particular case. The module can work being powered from the computer connected via an USB cable, and not using its own battery during the configuration.

To connect a module with a computer you must have an USB cable with A and B plugs.



Connecting the module to a computer is indicated by the LED marked as "USB". The diode lights then continuously.



More information about the usage of USB port for the module configuration is given in the **MTM** program user manual.

3.4 Powering of the module

The **MT-703** telemetry module can be powered only from the built-in set of batteries of nominal voltage 4.5 VDC. The batteries are placed inside the special holder under the main circuit board of the module. They are connected to the board by two-wire cable with a miniature plug. Such design makes easier the battery replacing ⁴⁵.

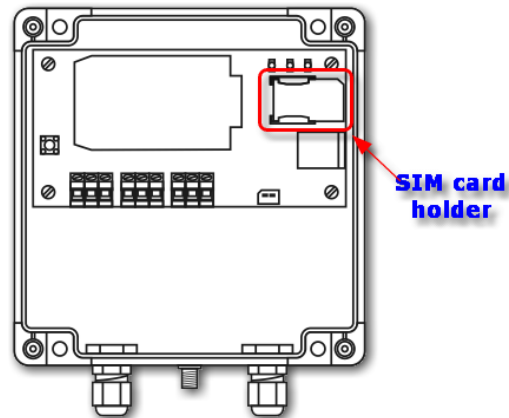
To reduce the initial and operating costs of the module powering, three industry-standard batteries of R20 type are used. The nominal capacity of such set amounts to 16 Ah, and usually allows for up to 5 years of correct module operation, depending on the number of transmission cycles. Using the factory-mounted set of batteries allows to avoid problems arising from an oxidation of contacts during long term operation. It is recommended to use always the same type of batteries or their equivalent having similar parameters.

The module can be optionally purchased in a **HC** version having the batteries of doubled capacity. The operation time of the module in **HC** version increases without the need of supplying new lithium batteries because inside the bigger housing of the module there is a set of six alkaline R20 batteries, identical as in a standard module. They provide the double capacity, and ensure the longer operation of the module even with frequent measurements.

To reduce the battery energy consumption, the module is powered via USB cable ⁴⁵ from PC host computer during the configuration procedures. The operation of the module with external power is indicated by lightning the USB LED. Additionally, during the module configuration you may set its constant activity option that simplifies the configuration itself.

3.5 SIM card

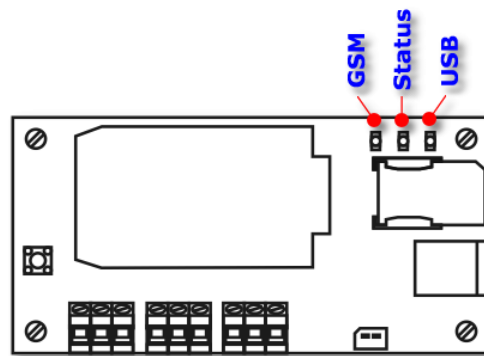
The **MT-703** telemetry module is equipped with a standard **SIM** card holder ensuring the proper connection of a card to the GSM modem. The holder is placed horizontally on the printed circuit board in the module housing.



The correct placement of the **SIM** card is important for a proper operation of the module. The module accepts only **SIM** cards built in **3.3 V** low voltage technology.

3.6 LEDs

The LEDs placed on the MT-703 module board simplify the running process of the module.



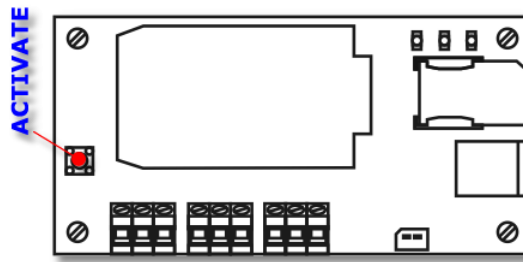
The LEDs have strictly assigned meanings:

- The **GSM** LED indicates the operation mode of the GSM module.
- The **Status** LED indicates activity and stand-by states of the GSM module.
- The **USB** LED indicates powering the module from external computer.

The detail description of signalling functions of the LEDs is given in the chapter LED signalling.

3.7 ACTIVATE button

The **ACTIVATE** button placed on the module board enables the immediate switching the module from stand-by to active state. If the module is active, the button switches it to the stand-by mode with 10 seconds delay after pushing.

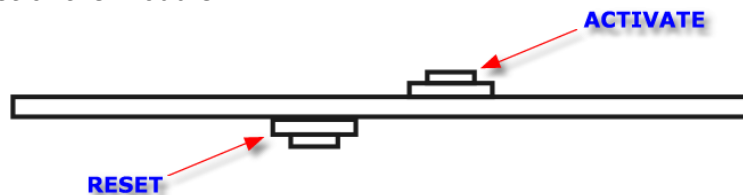


Such capability is useful when you want to check the GSM signal level and the module is in a stand-by mode. After pushing the **ACTIVATE** button, the module is waken up for 2 minutes and logins onto GSM network and onto GPRS. During this operations you can see the current GSM signal level indicated by the **STATUS** LED.

If the module is in the active mode, pushing the **ACTIVATE** button causes changing its status to stand-by for at least 2 minutes. It may cause the loss of events triggered by **T1** or **T2** timers, but assures the safe battery replacement.

3.8 RESET button

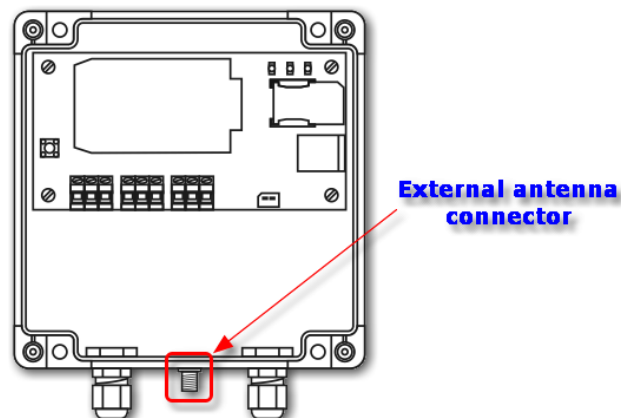
The **RESET** button is placed on the bottom side of the module board. It ensures the hardware reset of the module.



In the result of the operation the contents of totalizers assigned to binary inputs I1 and I2 are initialized to "0" (cleared).

3.9 The antenna

Connecting the antenna is necessary to provide the proper operation of the **MT-703** telemetry module. The antenna should be connected to the SMA (or optionally FME) socket placed on the bottom side of a module housing.



The antenna type depends on the local strength of GSM signal as well as on the

user needs. The place where antenna is mounted is very important as well. In case of the low GSM signal it may be necessary to use the directional antennas.

Alternatively, it is also possible to use the antenna located inside the module. To do this, you have to remove the SMA antenna socket from the bottom side of the module and mount it in the inner holder. The empty hole in the module housing should be sealed by the protective cap. This operation is not possible if the FME type socket is used.

3.10 Module housing

Due to the possible hard environmental conditions, the **MT-703** module housing is manufactured of the high quality plastics. It ensures enough protection (**IP67**) for the precision electronic instruments, even in very hard operating conditions. The module has standard housing manufactured by FIBOX company, catalogue number PCT121207 (or PCT121210 for **MT-703 HC** version). All specifications of the housing including material data are available on the manufacturer site www.fibox.com.

You should remember that the protection level provided by the housing depends on its correct closing and sealing the cable glands located on the bottom side. The housing which is opened or unsealed does not protect the electronic circuits and batteries inside.

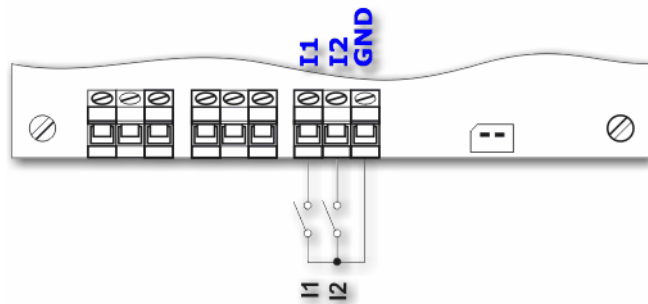
4 Connecting the module

In this chapter we present the recommended configurations for connecting the **MT-703** module, providing proper operation of its integrated inputs. There are configurations used for connecting the module:

Binary inputs I1, I2^[12]
Analog inputs AN1, AN2^[12]
Supply voltage^[13]

4.1 Connecting the binary inputs I1, I2

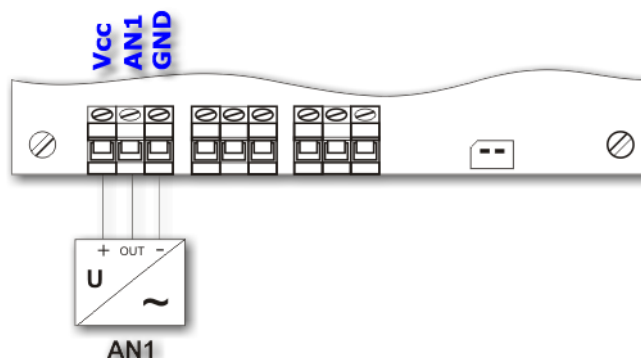
Due to the permanent activity of the binary inputs as well as the energy-saving operation of the **MT-703** module, the binary inputs require a connection with potential-free contacts only. Such contacts are placed between the input and the module ground connectors. Closing the contact is treated as a high state on the input (the negative logic).



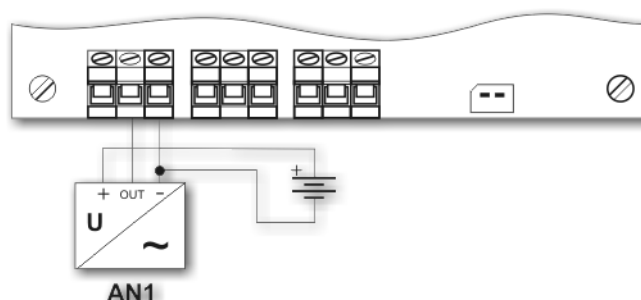
As you can see on the above picture, both inputs have the same reference potential. This is the electrical mass of the module, i.e., the negative pole of the supply voltage. The potential on the opened binary inputs is not greater than **2.5 VDC**.

4.2 Connecting the analog inputs A1, A2

The analog inputs of the **MT-703** module are the voltage type, with the input voltage range from 0 to 3.3 VDC.



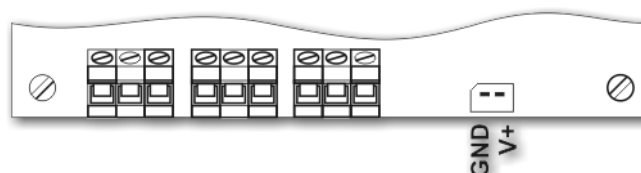
Beside the measuring connectors, the analog inputs have the 3.3 VDC supply voltage connector for powering the sensor, marked as Vcc. The supply voltage is switched on temporarily during the measurement only. This visibly decreases the energy consumption, but requires sensors with 3.3 VDC powering. If rated supply voltage of the sensor differs from this value, it is possible to use an external voltage source.



In case of an external powering, the common ground of an external battery should be connected to the common wire of analog input, and output signal from the sensor cannot exceed 3.3 VDC (i.e., the maximum value of the analog input voltage for the **MT-703** module).

4.3 Connecting supply voltage

The **MT-703** module is powered by the internal 4.5 VDC battery, consisting of 3 pieces of 1.5 V R20 alkaline cells (6 pieces in **HC** version). The total capacity of a new battery set is estimated as 16 Ah (32 Ah for HC). Depending on the data or SMS transmission events rate, it allows for an autonomous operation of the module without replacing the battery even up to 5 years.



The supply voltage is delivered by the cable with an asymmetrical plug, which fits the socket placed on the module board in one position only.

Attention!

Due to use of high capacity capacitor in the supply circuit, the disconnection of supply voltage does not result in immediate switching off the module. The activity of the module, depending on its current state, may still extend from several seconds up to half an hour after disconnecting the battery. Shorter discharging of the capacitor may be achieved by pushing the ACTIVATE button.

Due to the specific, energy-saving construction of the module, it is not possible to use other energy sources than internally mounted alkaline batteries. Especially it is important not to use the external voltage sources connected via long cables to the module board. Powering the module from the improper power supplies may cause the damage of the module.

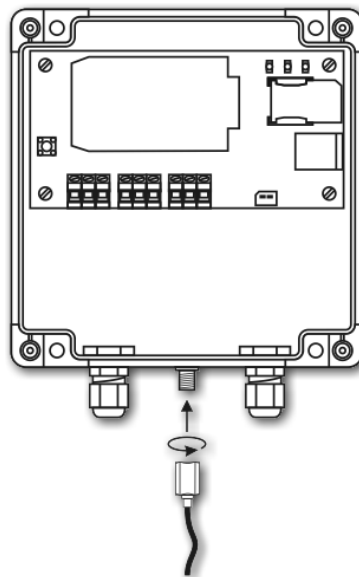
5 Running the module

Running the **MT-703** module requires several simple initial actions. At first, it is recommended to connect the module to the PC computer via USB cable, which enables either the transmission of the configuration data or the powering the module without using its battery. Then the further actions should be proceeded in the recommended order:

1. Connecting a GSM antenna^[15]. During each switching on, the antenna must be connected, because it is a load of the transmitter. Even without a SIM card, the GSM module exchanges information with the available networks to check the possibility of alarm connections (112).
2. Configuring^[15] the basic operational parameters of the module.
3. Mounting^[16] a SIM card.
4. Module restart^[17].

5.1 Connecting the antenna

Connecting an external antenna is necessary to proper operation of the module. The antenna type depends on its mounting and on the strength of the GSM signal in the antenna location. The antenna should be connected to the SMA (or optionally FME) socket placed on the bottom side of a module housing.

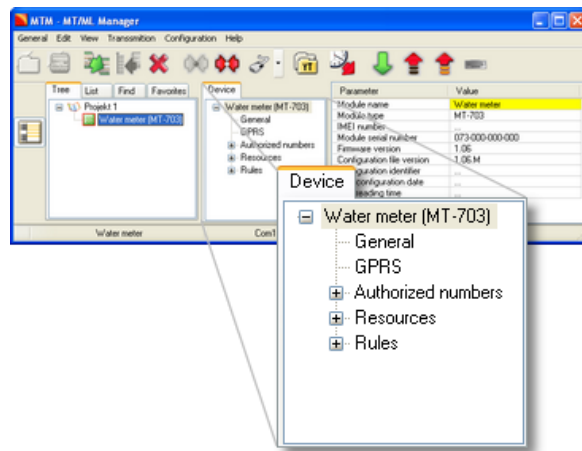


Alternatively, it is also possible to use the antenna located inside^[11] the module and then the external connection is not required.

5.2 Initial setup

During the initial setup of the **MT-703** module the parameters ensuring login onto GSM network and/or GPRS transmission are configured. To make this configuration properly, the module must be connected by an USB cable with the PC, which runs the **MTM** program. The details of installation, operation and usage of the **MTM** software with modules are described in the **MTM** user manual.

A proper login onto GSM/GPRS network requires the basic SIM card information and sometimes the information about APN, to which the module will be login to make a GPRS transmission. The basic parameters are as follows:



In the **General** group:

SIM card PIN number

You should enter a PIN code for a SIM card, which is to be placed in the module (until the card has not been set in the mode enabling its use without a PIN code).

GPRS usage

Yes - if you want to use a SMS messaging and a GPRS packet transmission
No - if the module has to operate in a SMS mode only.

In the **GPRS** group (it is visible only if the *GPRS usage* parameter is set to **Yes**):

APN name

You should enter the name of APN, which will be used in the GPRS transmission.

APN user name

You should enter the user name (if required by the network operator).

APN login password

You should enter the user's access password (if required by the network operator).

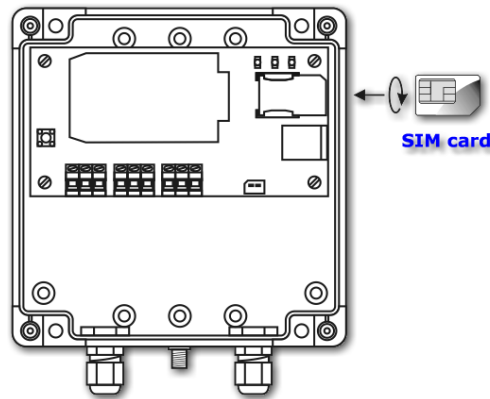
The above given parameters are the only ones required for a proper login the module onto a GSM/GPRS network. Note that a module configured in such basic manner has no possibility to send information. This means, that after checking a network login process you should configure the remain module parameters to enable the required use of the module.

5.3 Inserting SIM card

One of basic requirements for a proper operation of the module is a proper placement of the SIM card delivered by the GSM network operator. The network is used for SMS messaging and/or GPRS packet data transmission.

It is recommended to insert a **SIM** card while a supply voltage is off, so in the case of the **MT-703** module means not only disconnecting battery and USB cable but also waiting^[14] a time till the module is not active anymore. The SIM card can be placed in a holder before the initial setup is done. However, you should remember that after two attempts of entering a wrong PIN number, the module stops further logins to avoid the SIM card locking. In such case the card must be unlocked^[44].

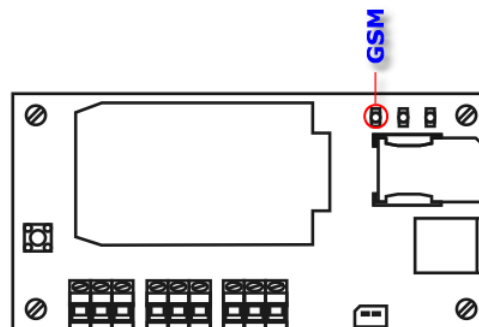
A **SIM** card should be inserted inside the holder on the circuit board of the module. You must insert it with the contact fields towards the bottom. The cut corner of the SIM card must remain outside the holder.



The correctly inserted SIM card provides a proper connection between its contact fields and the holder contacts, in which it has been placed.

5.4 Starting the module

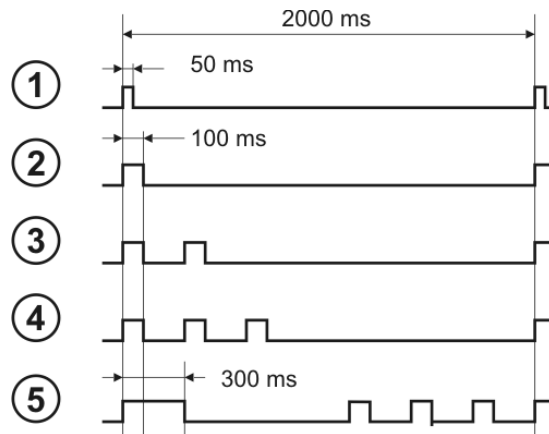
After the initial module setup and the installation of a SIM card you can run the module. If a SIM card installation has been done without power disconnection (not recommended), then for the module restart it is enough to push the RESET button. If the supply voltage has been disconnected during a SIM card installation, its connection automatically starts the module. The module behaves in identical manner either after connecting the external batteries or after powering it via an USB cable. The properly configured module should register itself in a GSM network and possibly login onto a GPRS network within several seconds. You can observe the login process on the GSM LED.



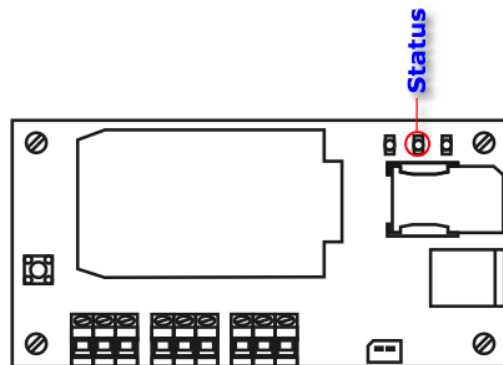
The GSM LED blinks according to the following steps in the login process:

1. No communication with the GSM modem
2. The GSM modem is running
3. The USB port of the MT-703 module is ready for communication
4. The GSM modem is registered in the GSM network
5. The GSM modem is logged in the selected APN of GPRS network

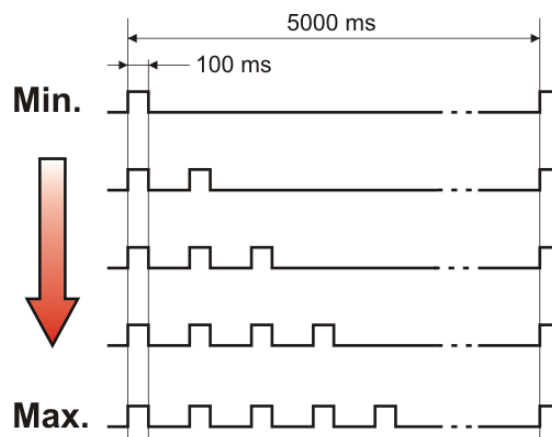
The blink repetition period and blinks duration are shown on the figure below.



In a case of problems with the network registration you should observe the Status LED.



During the login operation the Status LED shows the strength of GSM signal passing from the antenna to the module, in a scale 1...5.



If the diode is not blinking, it means that the GSM signal in the selected antenna location is too weak and does not guarantee the proper operation of the module. In such a case you should choose a new place for the antenna and restart the network login process. You should also remember that the GSM signal level indication is possible only after entering the correct PIN code, which activates the SIM card.

6 Configuration

6.1 General


The configuration of the **MT-703** module is accomplished by means of **MTManager** software (**MTM**). This software package is distributed free of charge to the users of our telemetric equipment.


The **MTManager** is a programmatic environment designed especially for managing the entire telemetric system despite of its size. It is capable to split hardware resources between Projects and Folders to make the managing of even very complex telemetric systems more effective.


All parameters described here become available for editing when the **MT-703** module is added into **MTM** environment and selected to edit. Details on functionality and **MTM** usage are given in User Manual of **MTManager**.


6.2 Groups of parameters


To make the configuration easier, the working parameters of **MT-703** module are grouped into the following logical or functional groups:


Header  – contains parameters which describe the module, its firmware and configuration (they cannot be modified).



General  – contains basic parameters used for setting operational mode of the module.

GPRS  – contains parameters required for login the module in GPRS network and parameters that provide transmission reliability.

Authorized Numbers  – contains lists of phone numbers and IP addresses which are allowed to communicate with the module.

Resources  – defines the working parameters of hardware and software resources used in reading and processing of measured data.

Rules  – contains lists of communication tasks which are triggered by specified criteria.

Besides the above mentioned groups of parameters, the **Initial setup**   group is also available. It provides pre-set values for selected resources of the module.

6.2.1 The Header group

The header of the telemetric module parameters structure stores basic information describing the module itself, its configuration and versions of working configuration files. The header information is not available for edit and is used only for viewing and inspection purposes.

6.2.1.1 Module name

Meaning	- Name associated with the module at the configuration phase
Data type	- Text
Variation range	- None, read-only parameter
Comment	- None

6.2.1.2 Module type

Meaning	- Type of the telemetric module
Data type	- Text
Variation range	- None, read-only parameter
Comment	- None

6.2.1.3 IMEI number

Meaning	- IMEI number of GSM modem
Data type	- Text
Variation range	- None, read-only parameter
Comment	- None

6.2.1.4 Module serial number

Meaning	- Serial number of telemetric module
Data type	- Text
Variation range	- None, read-only parameter
Comment	- This field contains unique and fixed serial number of the device and is used as the module identifier. It is originally assigned to the module by the manufacturer.

6.2.1.5 Module firmware version

Meaning	- Identifier of current firmware version of the MT-703 telemetry module
Data type	- Text
Variation range	- None, read-only parameter
Comment	- This item changes automatically after installation of a new firmware

6.2.1.6 Configuration file version

Meaning	- Identifier of the current version of the configuration file used for the module configuration
Data type	- Text
Variation range	- None, read-only parameter
Comment	- This value depends on the firmware version selected during production of the module. Additional extension letters allow creation of sub-version of the same general functionality

6.2.1.7 Configuration identifier

Meaning	- Identifier of the current configuration of the device
Data type	- Hexadecimal number

Variation range	- None, read-only parameter
Comment	- Parameter value increases by 1 with each successfully saved configuration

6.2.1.8 Date of last configuration

Meaning	- Date and time of the last effective update of the module configuration
Data type	- Text
Variation range	- None, read-only parameter
Comment	- This value changes automatically after the successful storing of configuration. It can be used for tracing of non-authorized configuration changes

6.2.1.9 Last readout of device time

Meaning	- Shows internal time value of the device as read at the moment of last configuration readout or at the moment of last setting of the module time
Data type	- Text
Variation range	- According to date and time format
Comment	- Can be used for the inspection of the time of last access to the module configuration and for the validation of internal real time clock (RTC) setting in the module

6.2.2 The General group

The **General** group contains parameters of the vital functions of the entire module. This is a place for entering data used in login the module to the GSM network and to defining its mode of operation. Note that entered values have the influence on the operation of the entire device. Invalid data can block the module.

6.2.2.1 SIM card PIN number

Meaning	- PIN number for the SIM card delivered by GSM operator. It is the access code for SIM card stored into module. If the card is not protected by PIN code, the value entered here has no meaning
Data type	- Text
Variation range	- Letters and digits, 8 characters maximum
Default value	- 0000
Comment	- Entering invalid value can block the operation of the entire module

WARNING!

Entering a valid PIN number is very important because invalid PIN prevents the module from running and can block the SIM card! Due to the possibility of SIM card blocking, only two attempts of access with invalid PIN are allowed. Further attempts are impossible after two unsuccessful ones.

The procedure used in case of blocking the module after two unsuccessful login attempts with invalid PIN code 

6.2.2.2 Access to configuration

Meaning	- Can limit access to the device configuration. By this parameter the user defines if changes in configuration are allowed only for selected IP addresses or for all addresses
Data type	- Selection list
Variation range	- All Access is granted for all IP addresses
	List Access is granted only for these numbers/addresses from Authorized numbers IP list that have set the Configuration option to Allowed .
Default value	- All
Comment	- Configuration access restrictions are limited only to the GPRS connections. Misuse of the parameter can block the remote access even for users who have access privilege

6.2.2.3 Configuration password

Meaning	- Password protecting the module configuration. The user will be asked for this password either during the local or the remote access attempt. The password is an important way of protecting against unauthorized changes of the module configuration. It does not prevent reading either the configuration or the status of the device
Data type	- Text
Variation range	- Letters and digits, 32 characters maximum
Default value	- None
Comment	- The only way to unblock the module is recalling the default factory settings, and that's why it is strictly recommended to store passwords in a safe place

6.2.2.4 GPRS usage

Meaning	- Allows selection of the mode of operation of the module
Data type	- Selection list
Variation range	- Yes The module operates in the GPRS mode, and attempts login to the selected APN after switching on. It is obligatory to use the SIM card in this mode because it enables access to the GPRS
	No The module operates in GSM mode. The only way of remote communication is SMS messaging. In this mode the module can use the SIM card without authorized GPRS access (for example pre-paid card)
Default value	- Yes
Comment	- None

6.2.2.5 SMS monthly limit

Meaning	- The maximum number of SMS messages which the module is allowed to send within one month period. This parameter protects the system against uncontrolled sending of huge numbers of messages, and that's why it decreases the total operational costs. Setting this parameter to "0" cancels all limitations
Data type	- Number
Variation range	- 0 ... 65535
Default value	- 0
Comment	- See note below

ATTENTION!
Reaching the SMS monthly limit stops immediately (i.e., without warning) SMS sending even in alarm states! This restriction stays valid until next month.

6.2.2.6 USB mode

Meaning	- Sets the operation mode of the module when it is powered from the USB cable during configuration
Data type	- Selection list
Variation range	- <i>Standard</i> After connecting the USB cable the module operates in the same way as during powering from the battery. The module is switched between activity and stand-by mode according to the metering determined by timers. <i>Always on</i> After connecting the USB cable the module is activated and stays in this mode despite the current working cycle. The module is not switched to the stand-by mode. As a result, the module has then a constant ability to be configured
Default value	- <i>Standard</i>
Comment	- None

6.2.2.7 Low battery voltage alarm

Meaning	- Sets alarm level for the module supply voltage
Data type	- Number
Variation range	- 1 ... 10000
Default value	- 5000
Associated flag	- Bat_Low
Comment	- Setting the flag on low battery voltage alarm is important, because the battery is the only one available power source for the module. Normally it is hard to precisely define the remaining battery capacity and its usability time, so this flag may be useful

6.2.3 The GPRS group

The **GPRS** group contains GPRS login and transmission parameters. Parameters assigned to this group are either obligatory or optional or used for the transmission optimization.

6.2.3.1 APN name

Meaning	- Name of the APN used in GPRS transmission
Data type	- Text
Variation range	- Letters, digits and special characters - 32 characters maximum
Default value	- Empty
Comment	- Lack of the APN disables login to the GPRS

6.2.3.2 APN user name

Meaning	- Name of the user allowed for access to the APN used in GPRS transmission
Data type	- Text
Variation range	- Letters, digits and special characters - 32 characters maximum
Default value	- Empty
Comment	- Optional parameter, entered only if required by the GSM network operator

6.2.3.3 APN login password

Meaning	- Login password for access to the APN used in GPRS transmission
Data type	- Text
Variation range	- Letters, digits and special characters - 32 characters maximum
Default value	- Empty
Comment	- Optional parameter, entered only if required by the GSM network operator

6.2.3.4 IP assignment

Meaning	- Selects the way of the IP assignment while login the module to GPRS network
Data type	- Selection list
Variation range	- <i>Static</i> Optimum mode for the transmission with static addressing, when the module obtains the same IP address with each login to the network <i>Dynamic</i> The alternative mode for static addressing. This mode requires special arrangement of data transmission and module identification based on its serial number instead of the IP address
Default value	- <i>Static</i>
Comment	- Static addressing within the network makes the transmission either to the base station or between modules easy. Availability of the static addressing depends on the GSM operator

6.2.3.5 IP address of the device

Meaning	- IP address of the module
Data type	- IP address format
Variation range	- 0.0.0.0 ... 255.255.255.255
Default value	- 0.0.0.0

- | | |
|----------------|--|
| Comment | - The address is entered for a new module in the system or read from the configuration during last login in the GPRS network for an existing module. If the address is not entered during the local configuration process then the remote configuration via GPRS is denied |
|----------------|--|

6.2.3.6 Spooler IP

- | | |
|------------------------|--|
| Meaning | - IP address of the computer which runs MT Spooler (i.e., the program for automated update of the module configuration). After login to the network the MT-703 module sends the information about its readiness for a configuration update to the entered IP address |
| Data type | - IP number format |
| Variation range | - 0.0.0.0 ... 255.255.255.255 |
| Default value | - 0.0.0.0 |
| Comment | - If the MT Spooler is not used, this field should not be changed and have 0.0.0.0 value. It prevents the repeated transmission attempts when the successful sending of the activity information is not acknowledged |

6.2.3.7 GPRS transmission repetitions

- | | |
|------------------------|---|
| Meaning | - The number of repeated attempts at sending information via GPRS when the receipt confirmation is not received within the period defined by the Transmission timeout ^[26] parameter |
| Data type | - Number |
| Variation range | - 0...255
Setting this parameter to "0" causes data to be sent without waiting for receipt confirmation. |
| Default value | - 3 |
| Comment | - Under normal conditions it is not recommended to set this parameter value greater than 3. Such a setting is safe enough for successful transmission and it does not block the processing of consecutive rules. Note that the next data portion will be sent after the successful end of current data transmission |

6.2.3.8 Transmission timeout

- | | |
|------------------------|---|
| Meaning | - Time to wait for confirmation receipt (in seconds) after sending a data frame. |
| Data type | - Number |
| Variation range | - 0...655 |
| Default value | - 9 |
| Comment | - This parameter together with GPRS transmission repetitions ^[26] influences the maximum time for sending a single data packet, that equals $(3 + 1) * 6 = 24s$ for default settings |

6.2.3.9 Number of login attempts

- | | |
|------------------------|---|
| Meaning | - Number of unsuccessful attempts of logins to the network (or to GPRS). Exceeding this number turns the module into standby mode |
| Data type | - Number |
| Variation range | - 0...255 |

- | | |
|----------------------|--|
| Default value | - 0 |
| Comment | - Setting this parameter to " 0 " means the login attempts can be repeated infinitely |

6.2.3.10 Dead time after error

- | | |
|------------------------|---|
| Meaning | - Dead time (in minutes) which is required before starting the next attempt of login to the network after an unsuccessful login event |
| Data type | - Number |
| Variation range | - 0...60 |
| Default value | - 5 |
| Comment | - Setting this parameter to " 0 " means login attempts will be repeated without any delay |

6.2.3.11 Data frame format

- | | |
|------------------------|--|
| Meaning | - Selects frame type used by modules in communication via GPRS (and, indirectly, the operating mode of the modules) |
| Data type | - Selection list |
| Variation range | - Standard
Standard operating mode. Devices communicate between each other and with other system elements using protocol and transmission protection defined by the manufacturer |
| | Open
Configuration and operating modes are the same as for Standard frames. The only difference is lack of frame protection and availability of header format in UDP frame. It allows the user to create customized system of access to the modules |
| Default value | - Standard |
| Comment | - For detailed information regarding "Open" format please contact our company |

6.2.4 The Authorized numbers group

The **Authorized Numbers** group contains the lists of phone numbers and IP addresses which the module will communicate with. The IP address list is also used as the base for defining access to the configuration changes and data receiving.

6.2.4.1 Number of authorised phone numbers

- | | |
|------------------------|--|
| Meaning | - Length of the list of phone numbers to which the SMS messages will be sent |
| Data type | - Number |
| Variation range | - 0...32 |
| Default value | - 1 |
| Comment | - This parameter allows easy definition of the required number of phones used in SMS rules. Value of the parameter varies required phones by adding or removing phone numbers by means of popup menu assigned directly to the Phone list |

6.2.4.2 Number of authorized IP addresses

Meaning	- Length of the list of IP addresses selected for GPRS communication with the module. Particular IP addresses have authorized access to the module configuration changes as well as to data queries
Data type	- Number
Variation range	- 0...32
Default value	- 1
Comment	- This parameter allows easy definition of the required number of IP addresses used in data rules. Value of the parameter varies via adding or removing IP addresses by means of popup menu assigned directly to the IP list

6.2.4.3 Phone

Item number	- Consecutive numbering of list items
Name	- User Friendly name of the phone number used for its easy identification in the rules. Name length is limited to 16 characters
Number	- Phone number assigned to the list item (14 characters maximum)

The **Phone** list items can be freely added or removed using the popup menu. This menu can be invoked by clicking the right mouse button on the list item or on the parameter window.

6.2.4.4 IP

Item number	- Consecutive numbering of the list items
Name	- User Friendly name of the IP address used for its easy identification in the rules. Name length is limited to 16 characters
Number	- IP address assigned to the list item
Configuration	- Grants or denies the remote configuration of the module for given IP address
Receive	- The data which comes from the module of a given IP address will be accepted or ignored according to this parameter value

The IP address list items can be freely added or removed using the popup menu. This menu can be invoked by clicking the right mouse button on the list item or on the parameter window.

6.2.5 The Resources group

The **Resources** group contains a list of available hardware and software resources of MT-703 module. Particular sub-groups contain characteristic parameters allowing for easy configuration of module inputs and outputs, internal logger and clocks.

6.2.5.1 Terminals

The **Terminals** subgroup covers all hardware resources which may be defined as inputs or outputs. Due to the characteristics of accepted signals, the binary and the analog inputs are distinguished. The final operation of each input depends on values of their configuration parameters.

6.2.5.1.1 Binary inputs I1, I2

The **MT-703** module has two identical binary inputs. An energy saving feature of the module assumes these inputs should be connected with potential-free contacts. Such contacts are placed between the input and the module ground terminal.

6.2.5.1.1.1 Name

- | | |
|------------------------|--|
| Meaning | - User friendly name of the input (e.g., related to its operation). This name is displayed on the list of connectors |
| Data type | - Text |
| Variation range | - Letters and digits, 16 characters maximum |
| Default value | - Resource name (I1, I2) |
| Comment | - User friendly names of connectors help to distinguish their destination as well as the required settings. |

6.2.5.1.1.2 Filtering constant

- | | |
|------------------------|---|
| Meaning | - Minimum time period (in milliseconds) required to stabilize the input state after its change |
| Data type | - Number |
| Variation range | - 8 ... 1000 |
| Default value | - 16 |
| Comment | - Entering the value appropriate for the characteristics of a connected contact prevents the multiple counting of the same pulse when the contact vibration appears |


6.2.5.1.1.3 Module activation

- | | |
|------------------------|--|
| Meaning | - Defines the method of the module activation |
| Data type | - Selection list |
| Variation range | - Yes
The binary input state change causes the module activation and starts the processing of rules
No
The function is disabled |
| Default value | - No |
| Comment | - Setting this parameter to Yes causes asynchronous and unconditional wake-up the module when the input state changes from logical 0 to 1. Such configuration allows to use the binary input as an asynchronous alarm trigger, useful in many situations (for example in guard systems) |

6.2.5.1.1.4 Totalizer

- | | |
|------------------------|--|
| Meaning | - Defines the additional totalizing function of the binary input |
| Data type | - Selection list |
| Variation range | - Yes
The binary input operates as a counter input. Each pulse appearing on the input increases the 32-bits totalizer content
No
The function is disabled |
| Default value | - No |
| Comment | - Total capacity of the totalizer: 4294967296 pulses. Pushing the RESET button clears the totalizer |

Attention!

There is a possibility to enter an initial value  into the totalizer to provide the synchronization between the totalizer content and the value already recorded in the connected mechanical counter.

6.2.5.1.1.5 Pulse weight

Meaning	- The weight of a single pulse count on the totalizer input (for example the weight is defined in liters in case of flow meter pulses counting)
Data type	- Number
Variation range	- 1 ... 65535
Default value	- 1
Comment	- This parameter allows to compute the initial value of the totalizer content according to the units set for the counter (for example, it may be expressed in liters in case of water meters). It should be set BEFORE the Initial setup of the totalizer associated with the binary input

6.2.5.1.1.6 Increment calculation

Meaning	- Enables or disables the totalizer increment computation after the previous readout
Data type	- Selection list
Variation range	- Yes Each activation of the module by the Measurement timer causes the computation of totalizer content increment, compared to the previously read value. The possible crossings of Hi alarm and Lo alarm levels are tested as well No The function is disabled
Default value	- No
Comment	- This functionality allows for the calculation of rate of change in a time unit defined by measurement timer

6.2.5.1.1.7 Alarm Hi

Meaning	- The Hi alarm level for the computed increment of the totalizer value
Data type	- Number
Variation range	- 0 ... 65535
Default value	- 0
Comment	- This parameter allows using an alarm condition in the rules processing

6.2.5.1.1.8 Alarm Lo

Meaning	- The Lo alarm level for the computed increment of the totalizer value
Data type	- Number
Variation range	- 0..65535
Default value	- 0

- | | |
|----------------|--|
| Comment | - This parameter allows using an alarm condition in the rules processing |
|----------------|--|

6.2.5.1.2 Binary input I3

The **MT-703** module has a special binary input I3, which is factory connected with a cover opening sensor. Activating this sensor causes immediate wake up of the module, and then the information about the cover opening may be sent out. The information may contain data packet or it may be a SMS message.

6.2.5.1.2.1 Name

- | | |
|------------------------|---|
| Meaning | - User friendly name of the I3 input (e.g., related to its operation). This name is displayed on the list of connectors |
| Data type | - Text |
| Variation range | - Letters and digits, 16 characters maximum |
| Default value | - I3 |
| Comment | - User friendly names of connectors help to distinguish their destination as well as the required settings. |

6.2.5.1.3 Analog inputs AN1, AN2

The **MT-703** module has two identical analog inputs. Each analog input is associated with the output of a supply voltage used for powering the analog signal sensor. Such solution allows to minimize the energy consumption comparing to continuous powering of a sensor.

6.2.5.1.3.1 Name

- | | |
|------------------------|---|
| Meaning | - User friendly name for input (for example, the name based on the input function) |
| Data type | - Text |
| Variation range | - Letters and digits, 16 characters maximum |
| Default value | - The resource name, for example AN1 or AN2 |
| Comment | - User friendly names assigned to the connectors allow an easy distinguish of their purposes and settings. The names are then displayed on the connector list |

6.2.5.1.3.2 Engineering units

- | | |
|------------------------|---|
| Meaning | - A name of the engineering unit used for measured values |
| Data type | - Text |
| Variation range | - Letters and digits, 16 characters maximum |
| Default value | - x |
| Comment | - None |

6.2.5.1.3.3 Low reference - engineering units

- | | |
|------------------------|---|
| Meaning | - The low reference level for engineering units |
| Data type | - Number |
| Variation range | - 0 ... 10000 |
| Default value | - 0 |
| Comment | - Together with remaining reference parameters, this one is used to transform the physical input signal range to the range expressed in engineering units |

6.2.5.1.3.4 Low reference - internal units

Meaning	- The low reference level for internal measuring units
Data type	- Number
Variation range	- 0 ... 1000
Default value	- 0
Comment	- Together with remaining reference parameters, this one is used to transform the physical input signal range to the range expressed in engineering units

6.2.5.1.3.5 High reference - engineering units

Meaning	- The high reference level for engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 330
Comment	- Together with remaining reference parameters, this one is used to transform the physical input signal range to the range expressed in engineering units

6.2.5.1.3.6 High reference - internal units

Meaning	- The high reference level for internal measuring units
Data type	- Number
Variation range	- 0 ... 1000
Default value	- 330
Comment	- Together with remaining reference parameters, this one is used to transform the physical input signal range to the range expressed in engineering units

6.2.5.1.3.7 Alarm HiHi

Meaning	- The HiHi alarm level for the signal on the analog input, expressed in engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 0
Comment	- Sets the flag used in rules processing

6.2.5.1.3.8 Alarm Hi

Meaning	- The Hi alarm level for the signal on the analog input, expressed in engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 0
Comment	- Sets the flag used in rules processing

6.2.5.1.3.9 Alarm Lo

Meaning	- The Lo alarm level for the signal on the analog input, expressed in engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 0
Comment	- Sets the flag used in rules processing

6.2.5.1.3.10 Alarm LoLo

Meaning	- The LoLo alarm level for the signal on the analog input, expressed in engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 0
Comment	- Sets the flag used in rules processing

6.2.5.1.3.11 Alarm hysteresis

Meaning	- The hysteresis value for the analog signal alarm levels expressed in engineering units
Data type	- Number
Variation range	- 0 ... 10000
Default value	- 0
Comment	- Setting the proper hysteresis value according to the variation of the signal prevents too frequent alarm flag settings in case of unstable signal source

6.2.5.2 Timers

The **Timers** group contains parameters used by two timers which influent the entire module operation.

The **Measuring timer** is responsible for periodic activation of the module in order to make the measurements, to compute the increments, to check the alarm levels and then to process the rules.

The **Transmission timer** was originally designated to initiate a transmission of the data logger content, but its cycle can be also used in other transmission tasks.

6.2.5.2.1 Start

Meaning	- A common start time used as the reference point for both the measuring and the transmission timers
Data type	- Time
Variation range	- 00:00 ... 23:59
Default value	- 00:00
Comment	- This parameter sets the point on the 24-hours time scale which is then used as the reference for the moments when measurements and data transmissions begin

6.2.5.2.2 Measuring timer (T1)

The **Measuring timer** is responsible for periodic activation of the module in order to make the signal measurements, to compute the signal increments, to check the alarm levels and then to process the rules.

6.2.5.2.2.1 Activity

Meaning	- Selects an activity of the measuring timer
Data type	- Selection list
Variation range	- Yes The timer is enabled No The timer is disabled
Default value	- No

- | | |
|----------------|--|
| Comment | - Disabling the Measuring timer makes impossible the use of the analog input signal as an alarm trigger |
|----------------|--|

6.2.5.2.2.2 Period

- | | |
|------------------------|---|
| Meaning | - A repetition period for the Measuring timer activation |
| Data type | - Selection list |
| Variation range | - <i>5 minutes, 15 minutes, 30 minutes, 1 hour, 3 hours, 6 hours, 8 hours, 12 hours, 24 hours</i> |
| Default value | - <i>6 hours</i> |
| Comment | - This parameter defines how frequently the module is activated to make the measurement, write its result into the data logger, evaluate alarms and process the rules. The repetition period begins in the moment defined by the Start parameter value |

6.2.5.2.3 Transmission timer (T2)

The **Transmission timer** was originally designated to initiate a transmission of the data logger content (if enabled), but its cycle can be also used in other transmission tasks.

6.2.5.2.3.1 Active

- | | |
|------------------------|--|
| Meaning | - Selects an activity of the transmission timer |
| Data type | - Selection list |
| Variation range | - <i>Yes</i>
The timer is enabled
<i>No</i>
The timer is disabled |
| Default value | - <i>No</i> |
| Comment | - None |

6.2.5.2.3.2 Period

- | | |
|------------------------|---|
| Meaning | - A repetition period for the Transmission timer activation |
| Data type | - Selection list |
| Variation range | - <i>5 minutes, 15 minutes, 30 minutes, 1 hour, 3 hours, 6 hours, 8 hours, 12 hours, 24 hours</i> |
| Default value | - <i>6 hours</i> |
| Comment | - This parameter defines how frequently the module is activated to send the data logger content. The repetition period begins in the moment defined by the Start parameter value |

Attention!

Due to the operational purposes the Transmission timer period should not be shorter than the period set for the Measuring timer

6.2.5.3 Logger

6.2.5.3.1 Activity

Meaning	- Selects an activity of the data logger
Data type	- Selection list
Variation range	- <i>Yes</i> The data logger is enabled <i>No</i> The data logger is disabled
Default value	- <i>No</i>
Comment	- None

6.2.5.3.2 Write timer

Meaning	- Selects the timer which will initialise the process of writing data to the logger
Data type	- Selection list
Variation range	- <i>Measuring timer</i> Writes data on activation of the Measuring timer <i>Transmission timer</i> Writes data on activation of the Transmission timer
Default value	- <i>Measuring timer</i>
Comment	- None

6.2.5.3.3 Receiver IP address

Meaning	- IP address of the destination device
Data type	- Selection list
Variation range	- User friendly names assigned to IP addresses which are allowed to communicate with the module
Default value	- IP1 (the first item on the list of authorized ²⁸ IP addresses)
Comment	- The destination IP address is selected on the basis of the list of user friendly names and that's why it is recommended to use unique, easy to remember naming convention

6.2.5.3.4 Parameter list

The parameter list contains all variables which are recorded in the data logger according to each cycle of the timer selected by the *Write timer*³⁵ parameter. Due to the fixed data logger capacity (576 data records), the number of variables which are to be recorded does not influence the allowed number of data records.

The variables which are to be recorded in the data logger should be marked on the parameter list.

6.2.5.4 Status

A **Status** of the module is a data record which may be sent as a result of the rules processing. The configurable content of such data record is available either in a form of data packet in the GPRS transmission mode or as a text message in the SMS mode.

The parameter list contains all parameters which can be used to create the **Status**. Selected variables should be marked on the list.

6.2.6 The Rules group

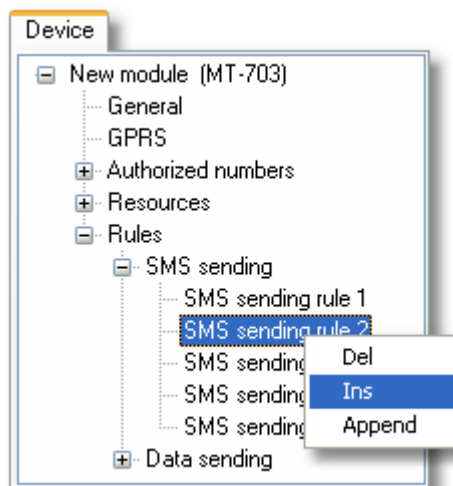
The **Rules** group contains lists of transmission tasks which are to be executed by module firmware according to the rule criteria. These tasks are divided into two sub-groups:

- Rules for [SMS sending](#)^[36]
- Rules for [data](#)^[38] transmission

In both cases the criteria are defined using the same resources and the same triggering conditions.

6.2.6.1 SMS sending

The list of rules for SMS sending can contain not more than 32 rules which enable sending the short text messages. The list items can be added or removed using popup menu that is invoked by clicking the right mouse button on the list item in the **MTM** program window.



The number of rules can be set by the value of [Number of SMS sending rules](#)^[36] parameter as well.

6.2.6.1.1 Number of SMS sending rules

Meaning	- Number of rules used in SMS sending
Data type	- Number
Variation range	- 1...32
Default value	- 1
Comment	- Decreasing this number does not delete the rule settings until the configuration is saved into module

6.2.6.1.2 SMS sending

Each rule on the list is defined by the following parameters:

[Trigger source](#)^[37]

[Trigger flag](#)^[37]

[SMS message text](#)^[37]

[Recipient number](#)^[37]

[Status sending](#)^[38]

6.2.6.1.2.1 Trigger source

Meaning	- Selects the source of event which can trigger the rule
Data type	- Selection list
Variation range	- <i>None</i> Rule disabled <i>I1, I2</i> Binary inputs <i>AN1, AN2</i> Analog inputs <i>T1, T2</i> Clock ticks <i>Bat_Low</i> Battery voltage low flag <i>Pow_On</i> Module power on flag
Default value	- <i>None</i>
Comment	- None

6.2.6.1.2.2 Trigger flag

Meaning	- Defines the flag associated with the selected input and used to trigger an event
Data type	- Selection list
Variation range	- <i>None</i> The rule is disabled <i>Bi In 0->1, Bi In 1->0</i> The flags which are to be set by the binary input state change <i>Min DTA, Max DTA</i> The flags which are to be set by a low and a high alarm level crossing for the totalizer increments on binary input, respectively. The totalizer increments (DTA = Delta) are computed within the measurement period <i>An LoLo, An Lo, An Hi, An HiHi</i> The flags which are to be set by alarm level crossings on the analog inputs
Default value	- <i>None</i>
Comment	- None

6.2.6.1.2.3 SMS message text

Meaning	- The text of the message to be sent when the rule is triggered
Data type	- Text
Variation range	- Letters, digits and special characters - maximum length is 160 characters
Default value	- .
Comment	- Total length of the SMS message text together with status information is limited to 160 characters. If the total length is greater than this limit then the message text is cut and status information is sent without changes.

6.2.6.1.2.4 Recipient number

Meaning	- Selects phone number of the message recipient
----------------	---

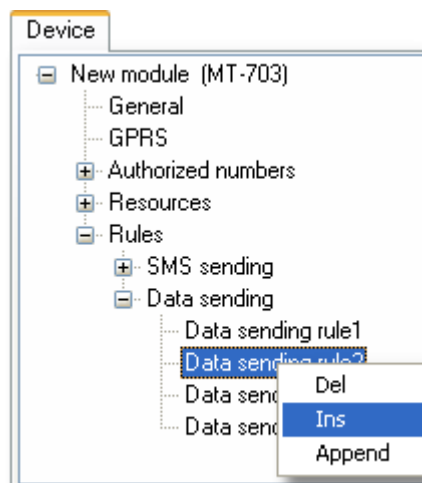
Data type	- Selection list
Variation range	- User friendly names of the phone numbers which are allowed ^[28] to communicate with the module
Default value	- NUM 1 - the first number on the list
Comment	- The phone number is selected on the basis of the list of user friendly names and that's why it is recommended to use unique, easy to remember naming convention

6.2.6.1.2.5 Status sending

Meaning	- Enables or disables the module status information attachment to SMS message text
Data type	- Selection list
Variation range	- Yes Status attached No Without status
Default value	- Yes
Comment	- Total length of the SMS message text together with status information is limited to 160 characters. If the total length is greater than this limit then the message text is cut and status information is sent without changes.

6.2.6.2 Data sending

The list of rules for data transmission contains not more than 32 rules which are used to trigger the transmission of the defined **Status** to the selected IP address. The list items can be added or removed using popup menu that is invoked by clicking the right mouse button on the list item in the **MTM** program window.



The number of rules can be set by the value of [Number of data sending rules](#)^[38] parameter as well.

6.2.6.2.1 Number of data transmission rules

Meaning	- Number of rules used for data sending
Data type	- Number

Variation range	- 1...32
Default value	- 1
Comment	- Decreasing this number does not delete the rule settings until the configuration is saved into module

6.2.6.2.2 Rule for data sending

Each rule on the list is defined by the following parameters:

[Trigger source](#) ³⁹
[Trigger flag](#) ³⁹
[IP address](#) ⁴⁰

6.2.6.2.2.1 Trigger source

Meaning	- Selects the source of event which can trigger the rule
Data type	- Selection list
Variation range	- <i>None</i> Rule disabled <i>I1, I2</i> Binary inputs <i>AN1, AN2</i> Analog inputs <i>T1, T2</i> Clock ticks <i>Bat_Low</i> Battery voltage low flag <i>Pow_On</i> Module power on flag
Default value	- <i>None</i>
Comment	- None

6.2.6.2.2.2 Trigger flag

Meaning	- Defines the flag associated with the selected input and used to trigger an event
Data type	- Selection list
Variation range	- <i>None</i> The rule is disabled <i>Bi In 0->1, Bi In 1->0</i> The flags which are to be set by the binary input state change <i>Min DTA, Max DTA</i> The flags which are to be set by a low and a high alarm level crossing for the totalizer increments on binary input, respectively. The totalizer increments (DTA = Delta) are computed within the measurement period <i>An LoLo, An Lo, An Hi, An HiHi</i> The flags which are to be set by alarm level crossings on the analog inputs
Default value	- <i>None</i>
Comment	- None

6.2.6.2.2.3 IP address

Meaning	- Selects IP address of the destination device
Data type	- Selection list
Variation range	- User friendly names assigned to IP addresses which are IP allowed ²⁸⁾ to communicate with the module
Default value	- IP 1 - the first IP address on the list
Comment	- The IP address is selected on the basis of the list of user friendly names and that's why it is recommended to use unique, easy to remember naming convention

6.3 Initial setup

The initial data setup mode is an extension to the normal module operation. It extends the possible applications of the module, and is not used to set the values of configuration parameters, but to set the initial values for selected resources. For example, the initial values are required when the module operates as a totalizer and counts pulses coming from a measuring device (say a water meter) which contained an initial non-zero value. Due to the **Initial setup** procedure the current value in the MT-703 totalizer can be seamlessly corrected by the external value and without disturbing the data acquisition process.

The **Initial setup** mode can be entered either from the *Configurator* menu or from the *Initial setup* toolbar button.



- Initial setup button

The **Initial setup** mode icon is active only when the **MT Spooler** is not used in a connection with the module and the transmission is enabled as well. It is assumed the only changed data is transmitted in the **Initial setup** mode. It means there is a possibility to initialise the module resources selectively. Note that sending the setup data causes the immediate and irrevocable activation of the resource.

After selection the **Initial setup** mode, the groups of configuration parameters disappear from the device window, and only the parameters allowed for the initial setup are displayed. In the MT-703 module there are the values of totalizers associated with binary inputs I1 and I2.

6.3.1 Totalizers

In the **MT-703** module the initial setup is allowed only for two resources, namely the **Totalizers** associated with binary inputs **I1** and **I2**.

Resource name	Initial value	Variation range
Totalizer 1	0	0.....2.147.483.647
Totalizer 2	0	0.....2.147.483.647

After entering a new resource value, the background of the list field changes to yellow. This means the value was actually changed and may be sent to the module using **Write changes** menu function.

Parameter	Value
Totalizer 1	21345
Totalizer 2	0

ATTENTION!

Working with **Initial setup** is possible only when the module is connected to the PC. This prevents the immediate data sending to the module which may cause the faulty initialization of the module resources.

6.4 Saving the configuration

After entering all required parameters the module configuration is still saved only on the disk of the computer which runs the configuration program. To save the configuration in the module, a transmission of data is needed.

The method of sending configuration to the module depends on the method of configuration. It can be local or remote via GPRS. In a local configuration method you may use a USB cable connected to the module. The detailed description of this method is given in the **MTM** program User Manual.

All battery powered modules working with standby/active cycles require the additional software for remote configuration. The software package named **MT Spooler** automatically sends the configuration data to the module immediately after its login to the network. More information on this program is available in the **MT Spooler** User Manual.

6.5 Verifying the configuration

Despite the reliability of both configuration methods, either local or remote, it is recommended to verify the configuration data stored in the module. This verification is particularly important when the module does not appear to work in accordance with the sent configuration.

In case of local method (with USB cable) the configuration should be read first and then the values of parameters can be verified. The module configuration reading method is described in the **MTM** program User Manual.

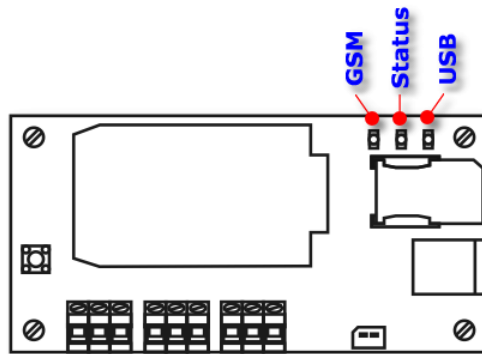
In case of remote method (with **MT Spooler** software) the configuration is automatically read after each update. The user can access the current configuration stored in the module and verify it on request.

7 Troubleshooting

7.1 LED signalling

The three **LEDs** placed on the circuit board of the **MT-703** module are a very useful diagnostic tool. As it was mentioned previously, each LED has a specific function and its name. Starting from the left, there are following diodes:

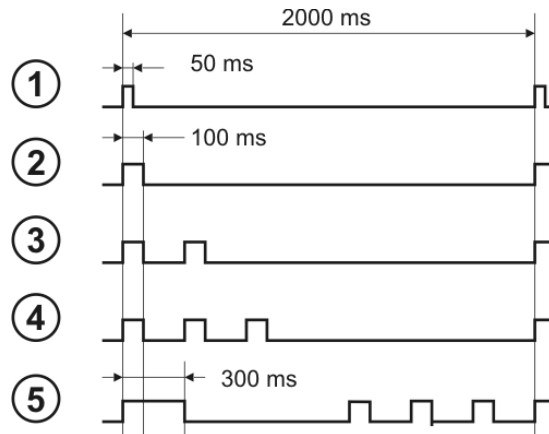
- The **GSM** LED
- The **Status** LED
- The **USB** LED



The purpose of the **GSM** LED is informing the user about the GSM modem status. Under a normal operation of the module, this LED indicates the change of a stand-by mode into an active mode, using short single blinks. The single and a little bit longer blink indicates a next step, when the GSM module is working and ready to activate the communication port. This means that the module is ready to communicate with configuration software, which is indicated by double blinks. Then triple blinks indicate that the module has successfully logged in the GSM network. If GPRS transmission is not configured, this moment indicates the end of the module activation. When the GPRS transmission is enabled, the fourth, more longer blink appears, and it means successful login to the selected APN. The consecutive steps in transition from the stand-by mode to the active mode (when the GSM/GPRS transmission is possible) are as follows:

1. No communication with the GSM modem
2. The GSM modem is running
3. The USB port of the MT-703 module is ready for communication
4. The GSM modem is registered in the GSM network
5. The GSM modem is logged in the selected APN of GPRS network

The blink repetition period and blinks duration are shown on the figure below.

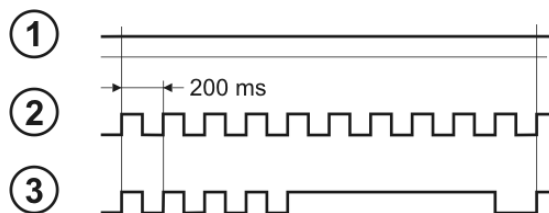


The above sequence of blinks is valid only with successful login onto the GSM/GPRS network. If such login is not possible, the GSM LED indicates some errors found in the login process.

The indicated errors are as follows:

1. SIM card error
2. PIN number error
3. Two attempts of entering wrong PIN number were found

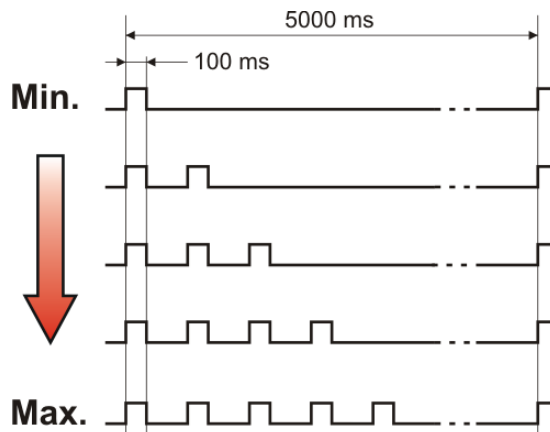
The graphical explanation of the **GSM** LED blinks when signalling errors is shown on the figure below.



One should remember that error number "3" (entering a wrong PIN code twice) requires the card must be unlocked in an ordinary GSM mobile phone. Details of this operation are given in the chapter "Unlocking the SIM card" [\[44\]](#).

If you cannot observe the sequences of LED blinks which indicate successful login, it is important to write down the error blink sequence before applying for a technical help. Such knowledge will help the service personnel to diagnose the faults.

Generally, the **Status** LED has only two purposes. Firstly, it indicates the stand-by mode of the module. It seems the module in such state is inactive, but in fact it executes the program provided for this mode. The blinks help to evaluate the proper operation of the module without its activation, thus without additional energy consumption. Secondly, the LED indicates the strength of a GSM signal passing from the antenna to the module. This strength is indicated by a blink series repeated every 5 seconds when the module is active. The number of blinks is proportional to the intensity of the signal, so it means, the more blinks the better are chances for a proper module operation. The lack of blinks during login to the network means that signal strength is too low and cannot guarantee a correct operation.



The **USB** LED serves as an indicator of a USB cable connection between the PC and the module. This link has two functions. First, it is the link used for transmission of configuration data, and second, it is a medium for powering the module during configuration process. Such solution ensures that even the long process of establishing the correct parameters of the **MT-703** module does not require the energy from batteries.

7.2 Unlocking the SIM card

As it is generally known, three attempts of entering a wrong PIN number make a SIM card locked, and unlock operation requires the knowledge of a PUK number. To avoid such situation, the module checks the number of faulty attempts written in a card, allowing only for two such attempts and disabling the third one even with the correct PIN number. Two faulty attempts are indicated ⁴³ by the **GSM** LED, and require a correction procedure from the user to enable future login. The unlock operation may be executed only if you know the valid PIN number.

To unlock the SIM card, you should:

- switch off the module power
- remove the SIM card from the module
- insert the SIM card into an ordinary mobile phone which accepts cards issued by the same operator
- switch on the phone and enter the valid PIN number
- if it has not been done before...
 - run the module
 - enter the valid PIN number into the module configuration
 - switch off the module power
- remove the SIM card from the phone and reinsert it in the module
- run the module

The above described procedures will reset the counter of faulty attempts stored in the SIM card and will enable the access to the card from the **MT-703** module.

An additional possibility of SIM card unlocking is provided by connecting the module to the PC and use a terminal emulation program (for example Hyperterminal). You must have some PC knowledge to use this procedure.

In this case, after having a properly configured and running Hyperterminal program, you should push the **ACTIVATE** button and then, during initial **15 seconds**, send from Hyperterminal the following command:

AT+CPIN=XXXX

where **XXXX** means correct **PIN** number.

You should remember that 15 seconds after pushing the **ACTIVATE** button, the module switches to a **MTM** communication mode and disables accepting **AT** commands.

7.3 Replacing the battery

Despite the large capacity of batteries powering the **MT-703** module, sometimes it may be necessary to replace them with the new ones. It is quite easy and does not require special preparations due to a special mechanical construction of the module. To replace the battery you should:

- remove the module cover, exposing its internal
- if the module is in a stand-by mode:
 - push the **ACTIVATE** button, thus activate the module
 - wait for login the module to the GSM/GPRS network
 - push the **ACTIVATE** button again, thus changing its mode to a stand-by
- if the module is active:
 - push the **ACTIVATE** button
- disconnect the battery cable from the module board
- pick-up the metal mounting plate with the module board
- remove the old battery set located under the plate and replace it with the new one
- pull down the metal mounting plate
- reinsert the battery cable into the socket on the module board
- check the process of module registration in the GSM/GPRS network
- close and seal the module cover.

It is recommended to use only the battery sets offered by the module manufacturer.

Warning!

Battery replacement must be done within 2 minutes period. If this time is longer, all data in the totalizers and RTC settings are lost.

Warning!

Due to a high level of environment protection class (IP67) it is necessary to take a special attention when closing a module cover. A proper placement of the module cover and strong fastening of the screws is required.

8 Technical specifications

8.1 General

Dimensions (height x width x depth)	122 x 120 x 65 mm (122 x 120 x 95 mm in HC version)
Weight (including batteries)	1030 g (1580 g in HC version)
Mounting method	4 holes
Operating temperature	-20° ... +50°C
Environment protection class	IP67 (option IP68)

8.2 GSM/GPRS modem

Model	WISMO Quick
GSM	Dual Band GSM/GPRS module EGSM900/1800
Frequency ranges (EGSM 900 MHz)	Transmitter: from 880 MHz to 915 MHz Receiver: from 925 MHz to 960 MHz
Peak power of the transmitter (EGSM 900 MHz)	33 dBm (2W) – Class 4 station
Frequency ranges (EGSM 1800 MHz)	Transmitter: from 1710 MHz to 1785 MHz Receiver: from 1805 MHz to 1880 MHz
Peak power of the transmitter (EGSM 1800 MHz)	30 dBm (1W) – Class 1 station
Modulation	0.3 GMSK
Channel separation	200 kHz
Antenna	50

8.3 Powering

Alkaline batteries 3 x R20 or 6 x R20	4.5 V
Average load current in the stand-by mode [uA]	<350 uA
Average load current during transmission [mA]	30 mA

8.4 Power supply output for analog sensor

Output voltage	3.3 V
Maximum output current	150 mA
Minimum activity period	50 s
Maximum activity period	120 s 300 s (active connection with spooler or logger data transmission)
Voltage settling time (before the measurement)	40 s

8.5 Binary inputs I1, I2

Contact polarisation voltage	2.5 V
Counting frequency	30 Hz max.
Minimum pulse width	16 ms

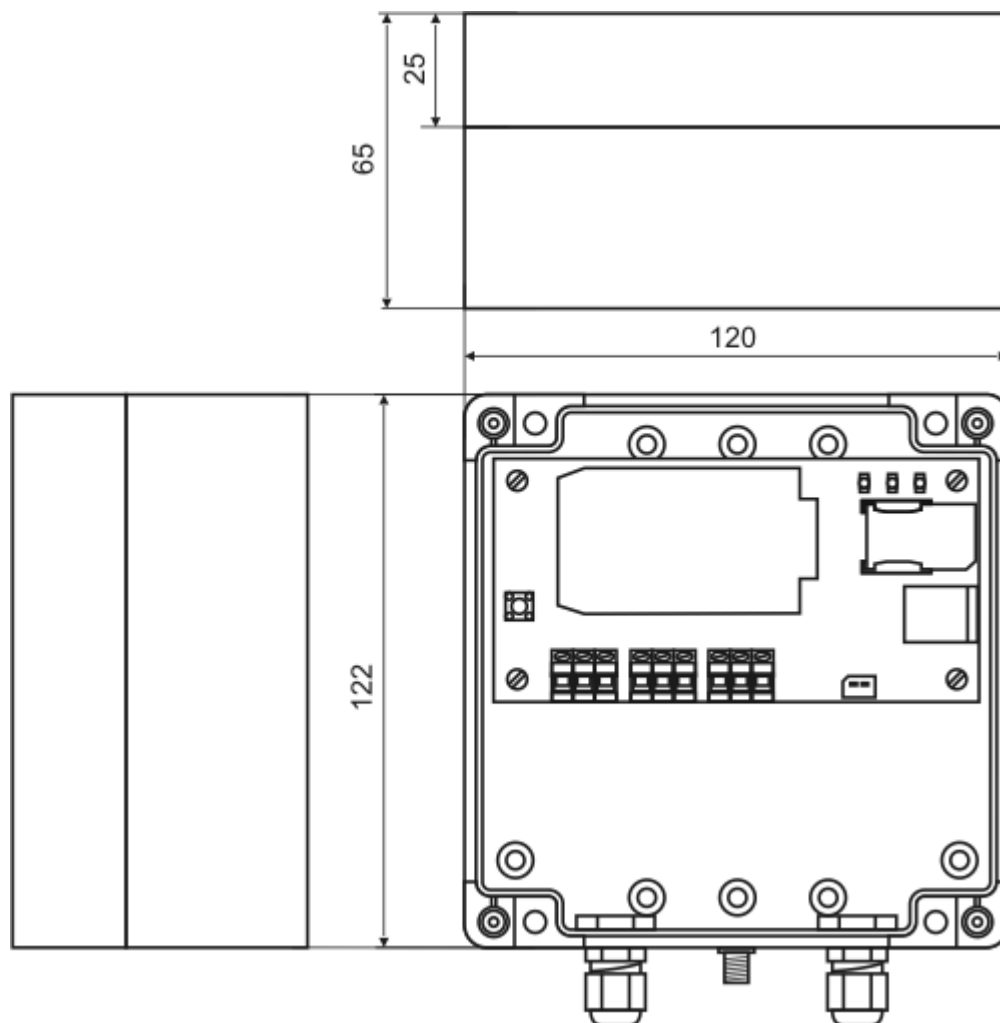
8.6 Analog inputs A1, A2

Measuring range	0-3.3 V
Input resistance	>200 k typical
Resolution	10 bits
Accuracy	±1%

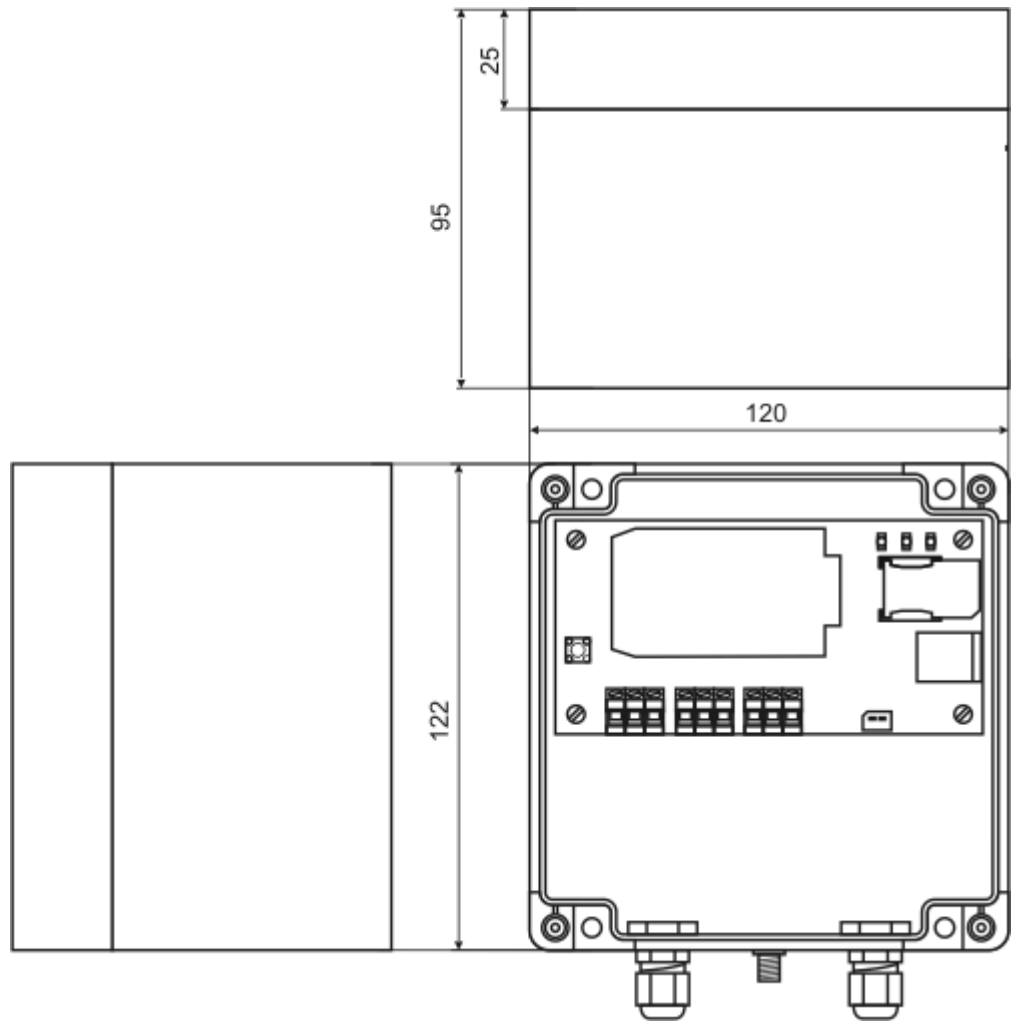
8.7 Internal logger

Memory type	FLASH
Maximum number of records	288
Minimum recording time	5 min.

8.8 Drawings and dimensions



MT-703 module (standard version)



MT-703 module (**HC** version)

Attention!
All dimensions are in millimetres

9 Safety information

9.1 Environmental issues

When choosing a place for a telemetry module operation you should comply to the local regulations. Using a telemetry module in forbidden areas may cause radio interference or other disturbances and it is strictly prohibited.

9.2 Electronic equipment

Despite the fact that most of the modern electronic equipment is properly protected from the influence of radio frequency (RF) signals you must remember that radio waves emitted by the antenna may badly influent on some of electronic devices.

9.2.1 Heart stimulators

It is recommended that a distance between the antenna of a telemetry module and a heart stimulator should be longer than 20 cm. It is a minimum distance recommended by the manufacturers of heart stimulators, which prevents the potential disturbances. This recommendation is in accordance with the results of tests carried by Wireless Technology Research.

9.2.2 Hearing aid equipment

In some cases a signal emitted by the antenna of a telemetry module may cause the disturbances in a work of hearing aid equipment. In such case you should learn a detailed usage recommendations of an hearing aid manufacturer.

9.2.3 Other medical equipment

The operation of each radio equipment, including a telemetry module, may cause disturbances in the functioning of electronic medical equipment. In case of need the telemetry module installation close to such equipment it is strictly recommended to contact the equipment manufacturer and to check the proper protection of the medical equipment against a radio frequency (RF) waves.

9.2.4 Marked devices

It is obligatory to comply with the regulations which prohibit mounting telemetry modules in the areas marked with the strict prohibition of use of radio frequency (RF) waves emitting equipment.

9.3 Physical and chemical conditions - possibility of the explosion

It is prohibited to mount the telemetry modules in places, in which the physical and chemical conditions may cause an explosion. Such places are often, but not always, properly marked, which helps their identification. In case of lack of such marking, the telemetry module should not be installed in places of liquid and gas fuel storage, flammable material storage, or places where metallic dust or corn plants seeds dust is present.

10 Appendices

10.1 Change log

Attention!

This MT-703 User Manual contains information relevant to current version²¹ of MT-703 firmware.

Please be aware that functionality of other firmware versions may differ.

Current version - **v1.06**

v1.06 - initial version

10.2 Memory map

Internal registers (read 3)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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0x0F (15)	AN2_I	Analog input AN2 internal units	No
0x10 (16)	AN1_E	Analog input AN1 engineering units	No
0x11 (17)	AN2_E	Analog input AN2 engineering units	No
0x11 (18)	VBAT	Battery voltage	No
0x11 (19)	SIGNAL_LEVEL	GSM signal level	
0x11 (20)	GPRS_LOG_F_CNT	Failed GSM login counter	
0x11 (21)	GPRS_FRAME_UNACK	Lost frame counter	
0x11 (22)	LOGGER RECORD NO	Consecutive number of logger record (regards the logger frames only)	No

10.3 Flags

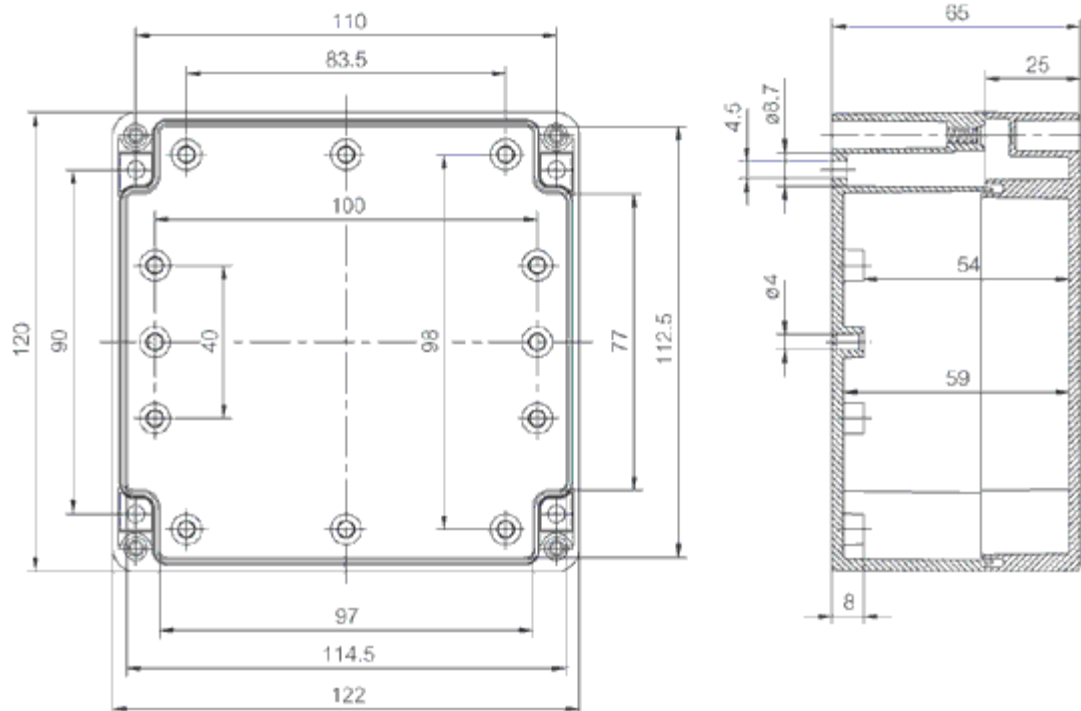
During the operation, the inner system of the MT-703 module sets several binary flags (with the values *True* or *False*), which enable the triggering of rules and the remote diagnostics of the module.

There are following flags available for the user:

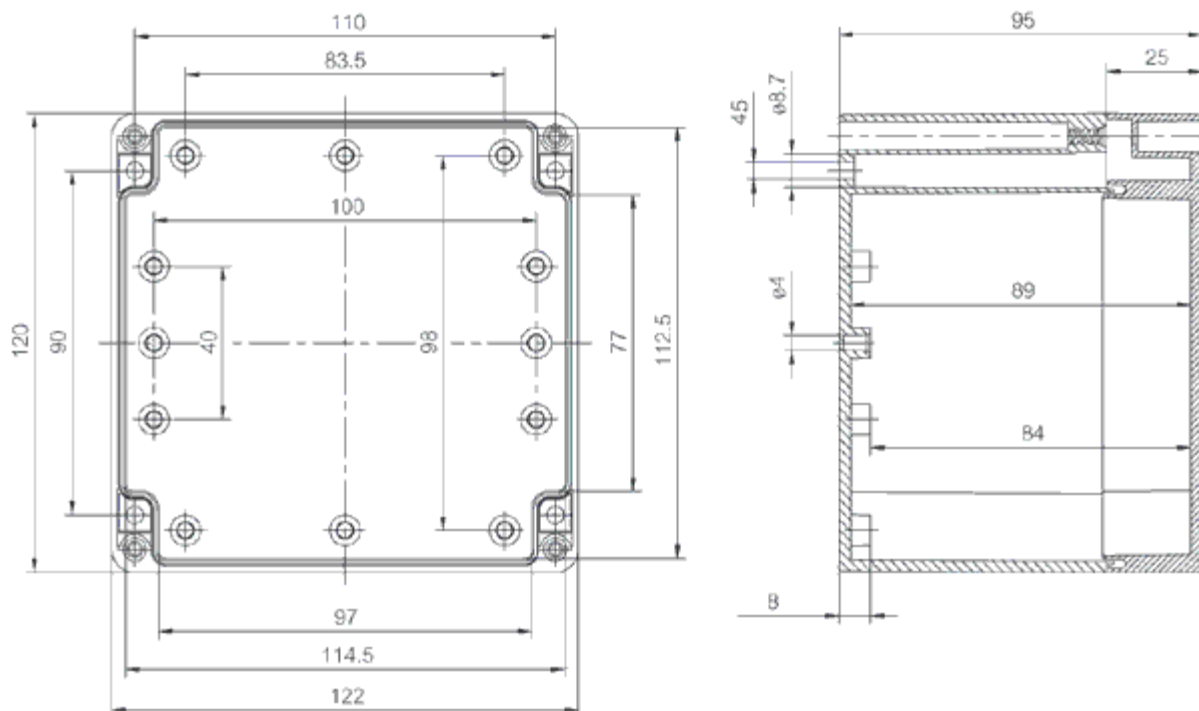
Flag	Assigned resources	Description
Bi In 0->1	Binary inputs I1, I2	Set to <i>True</i> after change of binary input state from 0 to 1
Bi In 1->0	Binary inputs I1, I2	Set to <i>True</i> after change of binary input state from 1 to 0
Min DTA	Totalizer on inputs I1, I2	Set to <i>True</i> if the totalizer content increment within the period determined by measuring timer is less than the value set for Lo alarm parameter. To activate this flag, the totalizer itself and the increment evaluation must be enabled
Max DTA	Totalizer on inputs I1, I2	Set to <i>True</i> if the totalizer content increment within the period determined by measuring timer is greater than the value set for Hi alarm parameter. To activate this flag, the totalizer itself and the increment evaluation must be enabled
An LoLo	Analog inputs AN1, AN2	Set to <i>True</i> if the value of signal on analog input is less than the value set for LoLo alarm level (taking into account the hysteresis value)
An Lo	Analog inputs AN1, AN2	Set to <i>True</i> if the value of signal on analog input is less than the value set for Lo alarm level (taking into account the hysteresis value)
An Hi	Analog inputs AN1, AN2	Set to <i>True</i> if the value of signal on analog input is greater than the value set for Hi alarm level (taking into account the hysteresis value)

An HiHi	Analog inputs AN1, AN2	Set to <i>True</i> if the value of signal on analog input is greater than the value set for HiHi alarm level (taking into account the hysteresis value)
Bat_Low	System	Set to <i>True</i> if the module supply voltage is less than the value set as the Lo alarm level for battery voltage
Pow_On	System	Set to <i>True</i> when the module is powered

10.4 Housing 121207 - drawing



10.5 Housing 121210 - drawing



10.6 Housing 121207/121210 - technical specification

Product card:

Materials:

Material:	Polycarbonate
Base colour:	RAL 7035
Cover colour:	Clear transparent
Cover screws material:	Stainless steel
Gasket material:	Polyurethane

Temperatures:

Min temperature °C (short term):	-40
Max temperature °C (short term):	120
Min temperature °C (continuous):	-40
Max temperature °C (continuous):	80
Min temperature °F (short term):	-40
Max temperature °F (short term):	250
Min temperature °F (continuous):	-40
Max temperature °F (continuous):	175

Rating:

Ingress Protection (EN 60529):	IP 66/67
Impact Resistance (EN 50102):	IK 08/07
Electrical insulation:	Totally insulated
Halogen free (DIN/VDE 0472, Part 815):	Yes
UV resistance:	UL 508
Flammability Rating (UL 746 C 5):	UL 94 5V
Glow Wire Test (IEC 695-2-1) °C:	960
NEMA Class:	NEMA 1, 4, 4X, 12, 13

Certificates:

Underwriters Laboratories
<u>Fimko</u>
Europe EN 50298: 1998
UL Canada
Gost R