

TELEMETRON

The new telemetry controller
MOBICON MT-156 HMI

page 60

AGREUS Agriculture 4.0,
or IIoT in agricultural practice

page 64

WEBXway – a new version
of the location system

page 76

Guide to
telemetry modules

pages 4-51

TELEMETRY MAGAZINE

dedicated to professional GSM/GPRS telemetry and GPS tracking solutions



Let's meet during the Fair

This year we took part in:

AUTOMATICON Fair 2018

20-23.03.2018, booth D9, hall I, EXPO XXI Warsaw Center, Prądzyńskiego 12/14 Street



Telemetron previous issues

Telemetron is available as the electronic version at www.inventia.pl



1st English Edition

Dear Customers,

We are giving you the next issue of TELEMETRON magazine informing about new solutions, products and implementations in telemetry, telematics and remote location, using mobile technologies GPRS / 3G / LTE and GPS. According to the new market trends, the presented notes also devote to solutions based on the cloud, Industrial Internet of Things (IIoT), Industry 4.0 and the MQTT protocols. We present new products in our offer, new technological solutions, new functional capabilities of telemetric modules and software as well as examples of applications implemented by our partners.

Our many years of experience in telemetry and cooperation with the Institute of Horticulture in Skierniewice, Poland, resulted in the development of the AGREUS System designated for modern agriculture. We have created DataPortal.online, an interactive visualization and reporting portal that allows convenient access to animated synoptic screens, graphs of report and alarm reports using mobile devices. WebXway is an online version of the Xway vehicle location system already known on the market. We hope that the cloud solution, the new user interface, and the new navigation method will be positively received by existing and new users.

As every year, we present examples of implementations of our partners. Mr Maciej Sawicki from Control System described applications made last year using the latest generation of MOBICON telemetry modules. The German company Eisenbahntechnik Munder GmbH used MT-713 telemetry modules to develop a rail track monitoring system, and the Irish company MultiBand monitors various types of production processes and supervises industrial devices using the MT-100 and MT-101 modules.

The latest edition of the magazine contains updated catalogue sheets of all standard telemetry and location modules produced by our company. The catalogue has been divided into various groups of applications distinct by colours. To facilitate the search for devices according to their resources, a summary of all modules in the form of a comparison table is available at the end of the bulletin.

We invite you to read!

Table of contents	Page
INVENTIA Ltd. Short description of activity	2-3
Guide to telemetry modules – introduction	4-5
Modules for monitoring and remote control, without programmable logic	6-11
Battery powered modules with waterproof housings	12-19
Modules for monitoring, remote and local control, with programmable logic (PLC) and communication with external devices (not applicable to MT-100)	20-31
Gateways with programmable logic	32-35
GPS / GPRS tracking modules	36-39
Special modules for lifts (m.in. alarm communication) and new modules dedicated to cathodic protection	40-45
Additional modules: expanders, sensors, buffered power supplies, converters	46-51
Sending e-mail notifications from MT-151	52-55
I/O simulators for telemetry modules	56-57
Implementation of the IEC 60870-5-104 protocol in MT-151	58
MQTT protocol in MT-331 telemetry modules	59
The new telemetry controller MOBICON MT-156 HMI	60-61
The new hardware version of the MOBICON series	62-63
AGREUS Agriculture 4.0, or IIoT in agricultural practice	64-67
DataPortal.online	68-75
WEBXway	76-79
Application: Telemetry modules in Control System applications	80-97
Application: Track monitoring system on MT-713 Eisenbahntechnik Munder, Germany	98-99
Application: Control of production processes MultiBand, Irland	100-101
Comparison table of telemetry and location modules, expanders and converters	102-105

in this issue:

The new telemetry controller MOBICON MT-156 HMI

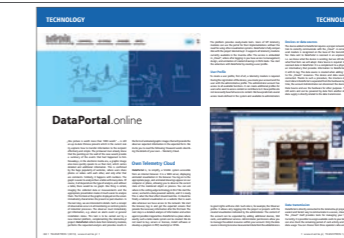
The new model MT-156 HMI is a telemetry controller for multichannel temperature measurement designated for heating, refrigeration, air conditioning systems, boiler rooms, server rooms and other facilities that require monitoring ...



More information on page 60.

DataPortal.online

„One picture is worth more than 1000 words” – is still an up-to-date Chinese proverb which in the current reality explains how to transfer information to the recipient effectively and simple. The primaeval man already knew that the painting on the wall of the cave would provide a summary of the events ...



More information on page 68.

INVENTIA Sp. z o.o. Short description of activity



Inventia was honored with the title GAZELLE of Business 2017 in the 18th edition of the ranking of the most dynamic small and medium companies

INVENTIA Sp. z o.o. was established in 2001 by spinning off into a new business the experienced design and construction department of AB-Micro, a company operating on the industrial automation market since 1984 as authorized distributor of Barco, Eplan, GE FANUC, GE Power Controls, Intellution and Hirschmann products.

INVENTIA has specialized in professional applications of GSM/GPRS and GPS mobile technologies since the very beginning, gaining a position as a global vendor of telemetry and location equipment within a few years. INVENTIA's solutions are developed by specialists having many years of experience in automation, telecommunications and IT technology.

Our solutions are distinguished by high quality of products, a 3-year warranty for professional-grade devices, innovative functionality, open architecture, scalability and the use of proven industry standards. User-friendly configuration and integration tools provide easy integration of INVENTIA's products with SCADA-based systems, relational databases, and management systems.

More than 40 authorized partner companies cooperate with us in Poland, implementing complex solutions in various branches of industry. We are constantly developing our exports and distribution network outside our country. We are proud that a Polish product and Polish technological concepts

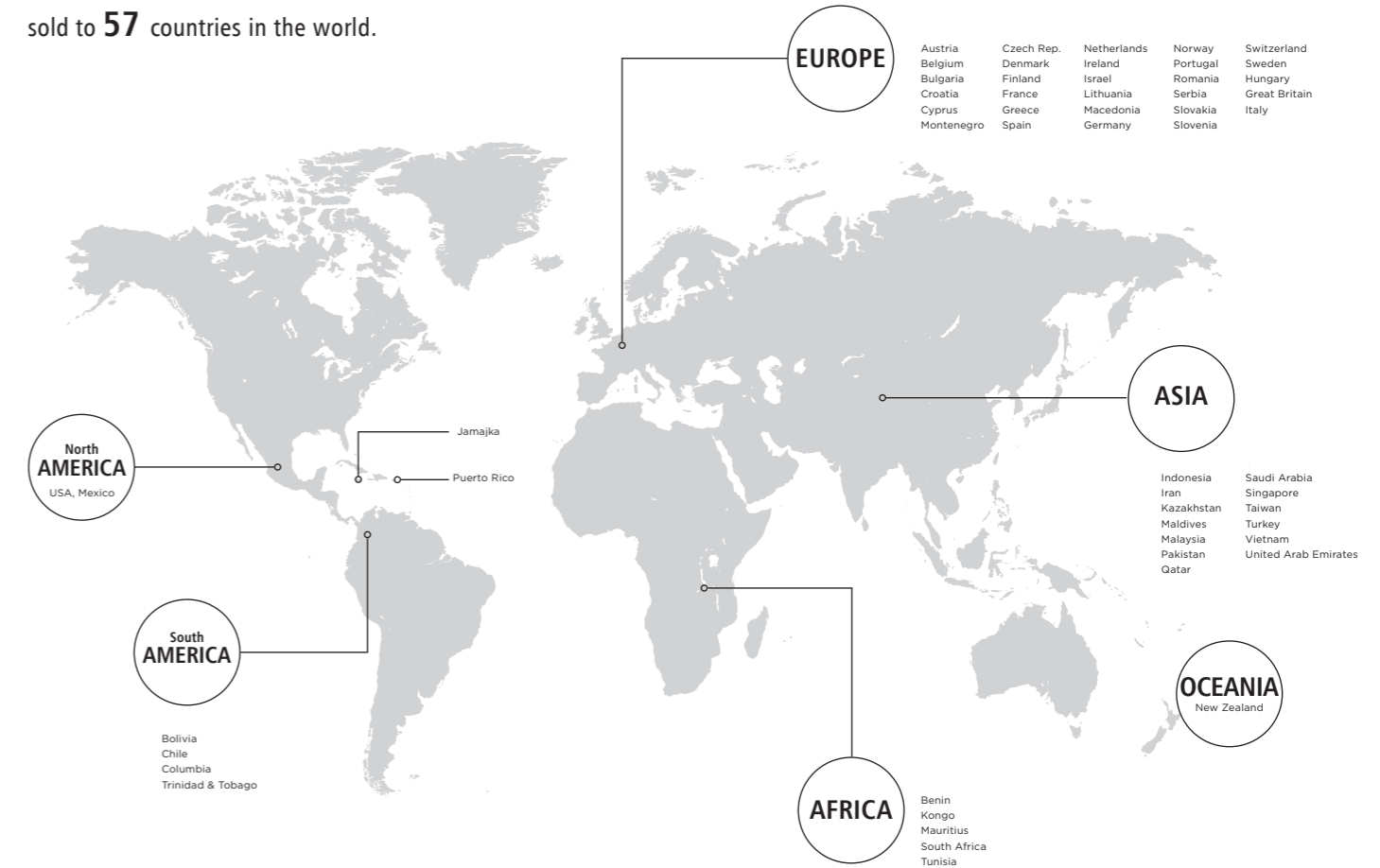
AUTOMATICON Fair 2016



The mission of the company is to provide a wide range of customers at home and abroad with its own, constantly improved and innovative technical solutions that are the basis of modern wireless data transmission systems for the stationary and mobile telemetry. Our mission is to develop and deliver comprehensive hardware and software solutions based on the latest technological advances in electronics and telecommunications.

are becoming the world standard for professional telemetry solutions and remote location. MT series telemetry modules have been awarded with prestigious prizes in Poland – Gold Medal of the AUTOMATICON Fair, Grand Prix of the WOD-KAN Fair, and PRODUCT OF THE YEAR 2012 of Control Engineering Poland.

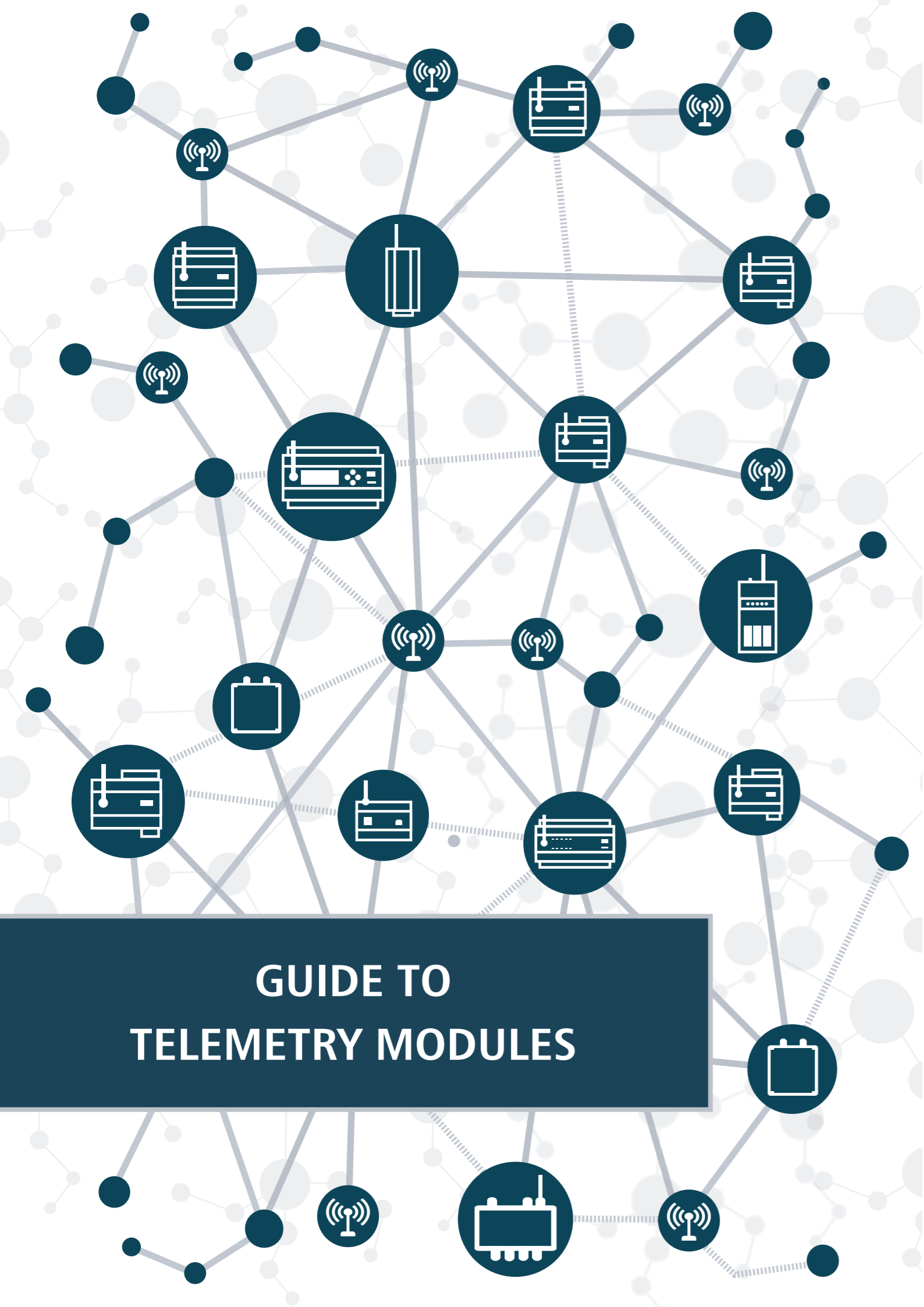
Our references cover over **90 000** telemetry and vehicle tracking modules sold to **57** countries in the world.



Our market success in Poland and in the world was built jointly with AB-MICRO, with which we were pioneers in promoting professional GPRS telemetry. Today our references consist of more than 90 000 telemetry and locating devices working in Poland and 57 countries worldwide, among them are Austria, Denmark, Sweden, France, Germany, Norway, Finland, Russia, Slovakia, Great Britain, Spain, Israel, Belgium, USA, the Netherlands, Turkey, Thailand, Greece, South Africa, Croatia, Colombia, Mexico, Malaysia, Tunisia, Switzerland, Vietnam, Romania, Mauritius, Taiwan, Chile, New Zealand, Congo, Italy, Hungary and Trinidad and Tobago.

The design, production and sales processes as well as services provided by INVENTIA are covered by the ISO 9001:2015 Quality Management System.





GUIDE TO TELEMETRY MODULES

From year to year we extend our product range by adding modules with new features and capabilities, as well as enriching the functionality of earlier models. In order to facilitate the selection of the telemetry module for a particular application, we publish a guide which summarizes the basic features of the modules and their detailed technical data. Legible pictograms make it easier to identify essential features of individual modules.

The comparison table on pages 102-105 helps to understand the details.

For ease of use, the telemetry modules are divided into several groups distinguished by different colours.

	Modules for monitoring and remote control, without programmable logic	MT-020, MT-021, MT-331
	Battery powered modules with waterproof housings	MT-051, MT-713 V2 MT-723, MT-723 PT
	Modules for monitoring, remote and local control, with programmable logic (PLC) and communication with external devices (not applicable to MT-100)	MT-100, MT-101, MT-102, MT-151 HMI V2, MT-151 LED V2 MT-156 HMI
	Gateways with programmable logic	MT-202 MT-251
	GPS / GPRS tracking modules	ML-231 ML-931
	Special modules for lifts Modules dedicated to cathodic protection	MT-512 MT-651 MT-652
	Additional modules: expanders, sensors, buffered power supplies, converters	EX-101, RM-120 MT-UPS-1, THF-01

Important properties and functionalities of the devices are indicated by the following pictograms:

	Device with SMS communication ability
	Device with e-mails sending ability
	Device with ability of data transmission via a second generation networks
	Device with built-in 2G or 3G modem
	Device with built-in GPS receiver
RS - 232 RS - 485	Device with RS-232 or RS-422/485 port
M - BUS	Device with built-in M-BUS interface
	Device with Ethernet port
	Device with MIM card
	Device supporting two SIM cards (Dual SIM)

DI / DO	Specifies the number of discrete inputs and outputs of the device
AI	Specifies the number of analogue inputs of the device
RTD	Resistance temperature detector inputs
	Device with programmable logic
	Device with a data logger
	Module with an enhanced IP class
	An energy efficient or energy-saving device
	Device with galvanic isolation circuits
	Mounting on DIN rail
	Warranty period

MT-020 – SMS/GPRS/e-mail module for remote monitoring, alarm and control applications

- Integral GSM/GPRS 850/900/1800/1900 modem
- Binary inputs and outputs (4/2)
- Analog inputs (2)
- USB port
- 1-Wire inputs (2)
- Direct Pt100 and NTC sensors reading
- DIN rail mounting
- Configurable via SMS – no PC needed
- Build-in SLA battery charger
- MIM option available
- SMA antenna connector



Telemetry module MT-020, thanks to its very attractive cost to feature ratio, is well suited for use in small sites remote monitoring systems. It allows monitoring, diagnosis and control of remote devices via text messages (SMS and e-mail), CLIP calls and using data packet transmission of GPRS network. Configurable text messages with a fixed or variable content (e.g. containing current measurement value) are convenient way to provide information to the monitoring center or directly to the defined staff phone numbers. Alarm messages can be generated on binary inputs and binary outputs state change, when measured analog values crosses alarm threshold, by timer and counter flags.

Communication via GPRS enables secure and reliable communication with higher-order applications (SCADA, database) allowing to expand the capabilities of the monitoring system using remote communication with difficult to access or distant sites.

Industrial design, practical I/O resources and easy-to-use software tools as well as the possibility of remote management of module via SMS commands or GPRS are the biggest advantages of MT-020. Direct connection of temperature sensors lowers the cost of building system. 1-Wire inputs can be used for reading typical Dallas pellets for the purpose of identification and authentication. The module can work with humidity sensors, water level sensors, pressure transducers, flow sensors, smoke, gas, motion, shock and noise detectors, etc.

MT-020 can be powered from a DC voltage source (9-30 VDC) or directly from the mains transformer (12-18 Vrms AC). Integrated circuit which controls and charges external battery ensures continuous system operation during power failures. Dedicated power output allows providing power to external sensors when operating from backup power source.

Optionally module can be produced with 3G modem and/or with MIM (Machine Identification Module) soldered to PCB replacing or backing-up standard SIM card.

Typical applications:

- Alarm systems
- Access control
- Preventive diagnostic
- Remote meter reading (AMR)
- Remote control of various devices by CLIP call, SMS or GPRS (gates, pumps, heating, lighting, etc.)

Resources

- 4 optoisolated binary inputs
- 2 potential less outputs with common ground
- Quad-band GSM/GPRS modem (optionally 3G modem)
- Dedicated Pt100 input (2- or 3-wire) that can be configured to operate as voltage (0 – 10 V/0 – 5 V) or current (4 – 20 mA) analog input
- Dedicated NTC sensor input that can be configured to operate as voltage (0 – 10 V/0 – 5 V) or current (4 – 20 mA) analog input
- A USB port for configuration and diagnostic equipment
- Real Time Clock (RTC) - possible external synchronization
- Two power outputs (one stabilized) providing power for external sensor
- SMA antenna connector

Functionality

- Two-way communication via SMS and GPRS
- Possibility to send SMS and e-mail messages or GPRS data frame on raise of alarm or according to schedule
- User-defined rules triggering communication (SMS, CLIP calls, e-mail, GPRS data frame) on binary inputs, timers flags, counters flags or registers and internal markers state change
- Binary inputs functionality:
 - configurable input filtering;
 - possibility of counting pulses in a user-specified range (max. 2 147 483 647) and direction (increase/decrease counter value)
- Analog values measurement:
 - temperature measurement with Pt100, NTC or 1-Wire sensors;
 - voltage measurement in 0 – 10 V or 0 – 5 V range;
 - current measurement in 4 – 20 mA range;
 - possibility of linear scaling results of the measurements to engineering units;
 - 4 alarm levels, alarm hysteresis, filtration & deadband parameters defined exclusively for each analog input
- Control outputs functionality:
 - bistable, monostable or toggle output with user-defined pulse duration time and normal state;
 - local control – control output state is changed by events;
 - remote control – output state is changed by writing via SMS/ingoing CLIP call/GPRS data frame value to module register

- Universal Timers functionality:
 - synchronization with internal RTC clock;
 - user-defined counted time range
- Configuration via USB port or from remote using SMS commands
- Dynamic insertion of the variables (e.g. temperature measurement, binary input state) into SMS text messages
- DTMF codes support
- Possibility of setting limits for SMS transmission
- Internal logger – records the history of device operation; capacity up to 48 000 entries
- 12/24V DC accepted power supply
- Reach diagnostic LED set (module status, GSM communication activity, GSM signal strength, binary I/O's state)
- User-friendly configuration tools
- OPC server for Windows

General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting type	DIN Rail 35 mm
Operating temperature	-20 to +55 °C
Protection class	IP40

GSM/GPRS Modem

Modem type	µblox LEON G100
GSM	Quad Band (850/900/1800/1900)
Class	10
Antenna	50 Ω

Power

Power voltage range DC	9 – 30 V	
Power voltage range AC	12 – 18 Vrms	
Current for 12 VDC	Idle 0,05 A	Max 1,5 A
Current for 24 VDC	Idle 0,03 A	Max 1 A

Binary inputs I1 – I4

Signal voltage range	0 – 30 V
Input resistance	12,7 kΩ
Input ON (1) voltage	> 9 V
Input OFF (0) voltage	< 3 V
Minimum pulse duration	10 ms

Outputs Q1 – Q2

Output type	NPN switch to GND
Recommended load current for one output	50 mA
Max. load current for one output	250 mA
Resistance in ON state	3 Ω max.
Max. load current for both outputs powered from VOUT1	150 mA max.

Analog inputs AN1, AN2 – voltage measurement

Measurement range	0 – 5 V/0 – 10 V
Maximum input voltage	18 V
Input dynamic impedance	150 kΩ typ.
Accuracy	± 1,5% max.
Nonlinearity	± 1% max.

Analog/Pt100 input AN1 – temperature measurement

Sensor type	Pt100, 2- or 3-wired
Wires resistance compensation	yes (applies only to 3-wire sensor)
Measurement range	-40 do +200 °C
Accuracy	± 1 °C

Analog/NTC input AN2 – temperature measurement

Sensor type	NTC 10 k
Measurement range	-25 to +55 °C
Accuracy	± 1 °C (depending on used sensor)

Analog inputs AN1, AN2 – current measurement

Measurement range	4 – 20 mA
Maximum input current	50 mA max.
Input dynamic impedance	100 Ω typ.
Voltage drop at 20mA	2 V max.
Accuracy	± 1,5 % max.
Nonlinearity	± 1 % max.

Backup battery input ACCU

Nominal battery voltage	6 V
Battery type	Lead-acid/gel
Max. charging current (recommended minimum battery capacity*)	0,4 A (1,3 Ah) 0,8 A (3,0 Ah)

* Please check battery specification

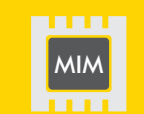
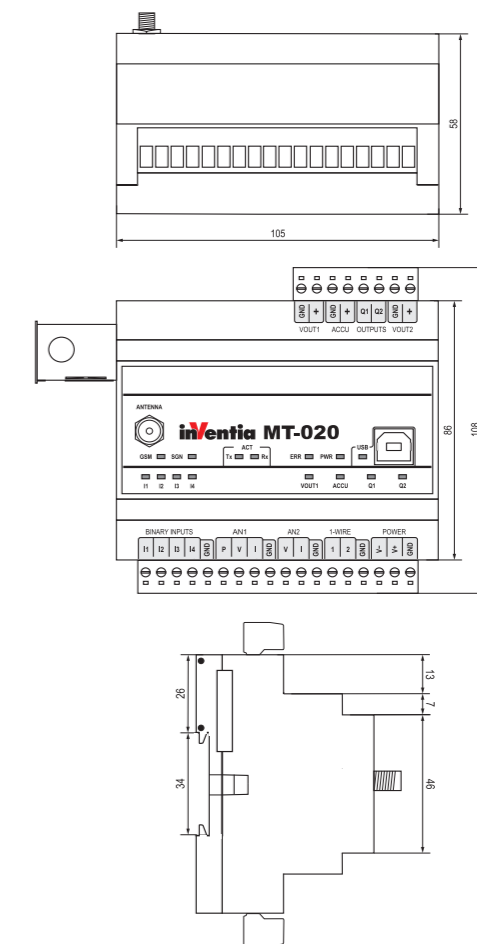
Power output VOUT1 (stabilized)

Output voltage	configurable - 12 V or 20 V
Max. load current for 20 V	150 mA

Power output VOUT2 (non-stabilized)

Output voltage	V _{power} - 2 V
Max. load current	50 mA

Drawings and dimensions (all dimensions in millimeters)



MT-021 – SMS/e-mail module for remote monitoring, alarm and control applications

- Integral GSM 850/900/1800/1900 modem
- Binary inputs and outputs (4/4)
- Analog inputs (2)
- USB port
- 1-Wire inputs (2)
- Direct Pt100 and NTC sensors reading
- DIN rail mounting
- Configurable via SMS – no PC needed
- E-mail messaging via GPRS



- SMA antenna connector
- Reach diagnostic LED set (module status, GSM communication activity, GSM signal strength, binary I/O's state)
- User-friendly configuration tools
- OPC server for Windows

General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting type	DIN Rail 35 mm
Operating temperature	-20 to +55 °C
Protection class	IP40

GSM/GPRS Modem

Modem type	μblox LEON G100
GSM	Quad Band (850/900/1800/1900)
Class	10
Antenna	50 Ω

Power

Power voltage range DC	9 – 30 V	
Power voltage range AC	12 – 18 Vrms	
Current for 12 VDC	Idle 0,05 A	Max 2 A
Current for 24 VDC	Idle 0,03 A	Max 1,5 A

Binary inputs I1 – I4

Signal voltage range	0 – 30 V
Input resistance	5,4 kΩ
Input ON (1) voltage	>9 V
Input OFF (0) voltage	<3 V

Outputs Q1 – Q4

Output type	optoisolated, normally open relay
Maximum voltage between contacts	250 VAC/300 VDC
Load current	6 A/230 VAC, 6 A/24 VDC
Maximum switching current	15 A/20 ms
Resistance	<100 mΩ

Analog/Pt100 input AN1 – temperature measurement

Sensor type	Pt100, 2- or 3-wired
Wires resistance compensation	yes (applies only to 3-wire sensor)
Measurement range	-40 to +200 °C
Accuracy	±1 °C

Analog/NTC input AN2 – temperature measurement

Sensor type	NTC 10 k
Measurement range	-25 to +55 °C
Accuracy	±1 °C (depending on used sensor)

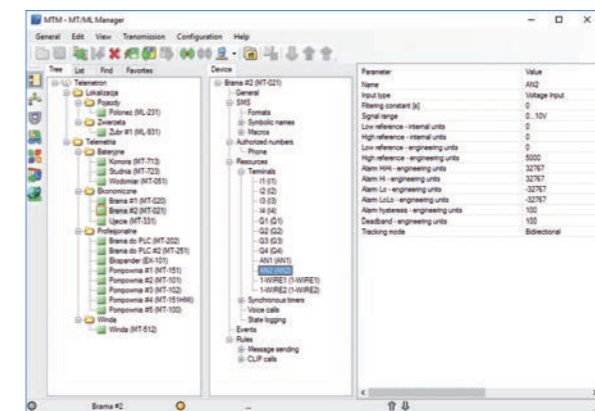
Analog inputs AN1, AN2 – voltage measurement

Measurement range	0 – 5 V/0 – 10 V
Maximum input voltage	18 V
Input dynamic impedance	150 kΩ typ.
Accuracy	±1,5 % max.
Nonlinearity	±1 % max.

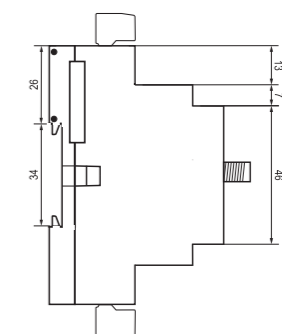
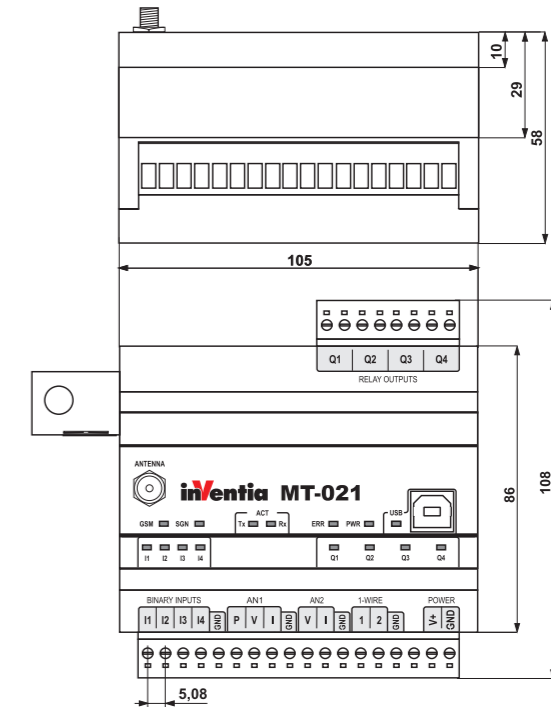
Analog inputs AN1, AN2 – current measurement

Measurement range	4 – 20 mA
Maximum input current	50 mA max.
Input dynamic impedance	100 Ω typ.
Voltage drop at 20 mA	2 V max.
Accuracy	±1,5 % max.
Nonlinearity	±1 % max.

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



Telemetry Module MT-021 with built-in GSM modem is a device dedicated for remote monitoring, diagnostics and control of objects via short text messages (SMS/e-mail) or CLIP calls. Configurable messages send from device with static (text) or dynamic (text and measured values) content are a convenient way of passing important information to the monitoring center, or directly to the defined phone numbers. SMS and e-mail messages sending can be triggered by change of binary input state, reaching alarm thresholds, marker state change, counters and clocks. Industrial design, practical set of I/O resources, easy to use software tools as well as the ability to configure the module from remote via SMS commands are significant advantages of MT-021 in the wireless telemetry systems. Direct connection of temperature sensors lowers the cost of building system. 1-Wire inputs can be used for reading typical Dallas pellets for the purpose of identification and authentication. The module can work with humidity sensors, water level sensor, pressure transducers, flow sensors, smoke, gas, motion, shock and noise detectors, etc.

Typical applications:

- Alarm systems
- Access control
- Preventive diagnostic
- Remote meter reading (AMR)
- Remote control of various devices by CLIP call or SMS (gates, pumps, heating, lighting, etc.)

Resources

- 4 optoisolated binary inputs
- 4 relay – potential less outputs
- Dedicated Pt100 input (2- or 3-wire) that can be configured to operate as voltage (0 – 10 V/0 – 5 V) or current (4 – 20 mA) analog input
- Dedicated NTC sensor input that can be configured to operate as voltage (0 – 10 V/0 – 5 V) or current (4 – 20 mA) analog input
- Two 1-Wire inputs that can operate also as serial ports
- A USB port for configuration and diagnostic equipment
- Real Time Clock (RTC) with the possibility of external synchronization

Functionality

- Two-way communication via SMS and e-mail alarming
- Possibility to send SMS and e-mail messages on raise of alarm or according to schedule
- User-defined rules triggering communication (SMS, CLIP calls, e-mail) on binary inputs, timers flags, counters flags or registers, and internal markers state change
- Binary inputs functionality:
 - configurable input filtering;
 - possibility of counting pulses in a user-specified range (max. 2 147 483 647) and direction (increase/decrease counter value)
- Analog values measurement:
 - temperature measurement with Pt100, NTC or 1-Wire sensors;
 - voltage measurement in 0 – 10 V or 0 – 5 V range;
 - current measurement in 4 – 20 mA range;
 - possibility of linear scaling results of the measurements to engineering units;
 - 4 alarm levels, alarm hysteresis, filtration and deadband parameters defined exclusively for each analog input
- Control outputs functionality:
 - bistable or monostable output with user-defined pulse duration time;
 - local control – control output state is changed by events;
 - remote control – output state is changed by writing via SMS/ingoing CLIP call value to module's register
- Universal Timers functionality:
 - synchronization with internal RTC clock;
 - user-defined counted time range
- Configuration via USB port or from remote using SMS commands
- Dynamic insertion of the variables (e.g. temperature measurement, binary input state) into SMS text messages
- DTMF codes support
- Possibility of setting limits for SMS transmission
- Internal logger – records the history of device operation; capacity up to 48 000 entries
- 9 – 30 V DC accepted power supply
- DIN rail mounting



MT-021

MT-021

MT-331 – Telemetry GSM/GPRS/EDGE Module

- Integral, five band GSM/UMTS modem 800/850/900/1800/1900/2100 (2G/3G)
- Independent CPU and watchdog system
- Electronics protected with varnish
- GPRS/HSPA packet transmission
- 4 configurable binary inputs/outputs
- 2 dedicated binary/counter inputs
- 2 configurable binary/4–20 mA analogue inputs/ 0–10 V analogue inputs
- 1-Wire port
- Supply output for powering external sensor (7–24 V)
- LED status diodes (GSM logon, GPRS logon, GSM signal strength, device activity, status of the module)
- Internal built-in Li-ion battery (1300/2600 mAh-option)
- Energy saving functions for DC supply or solar panel (green line products of Inventia)
- Data logger with capacity of 28000 records
- Remote configuration, programming, actualizations and diagnostic via GPRS/HSPA
- Micro USB configuration port
- Option of soldered MIM card replaced SIM or using for redundancy communications
- Internal temperature measurement
- Pressure and/or humidity measurements
- 3 year warranty



- Unsolicited message according to event rules and scheduler
- Dynamical SMS contents
- DIN rail mounting
- Energy saving function – modem is powered only when transmitting
- User Friendly configuration software

General

Size (height x width x depth)	124x63x30 mm
Mass	100 g
Mounting method	szyna DIN 35 mm
Operating temperature	0 to +55 °C for battery 1,3 Ah -20 to +55 °C for battery 2,6 Ah
Protection class	IP40

2G/3G Modem

Modem type	uBlox SARA-U201
GSM	Czterozakresowy (850/900/1800/1900)
WCDMA (UMTS)	800/850/900/1900/2100
Antenna	50 Ω

Power supply

Direct current DC	7 – 30 V		
Mean input current (for 12V DC without external recipients)	Idle	Active	Max
	10 mA	180 mA	250 mA
	Internal lithium-ion accumulator		
	1300 mAh or 2600 mAh		

Sensors powering output VOUT

Output voltage regulation range	7 – 24 V
Regulation step	0,1 V
Max. output current	20 mA at 24 V 40 mA at 7 – 16 V

Analog inputs 1W, AN1, AN2

Input 1W – temperature measurement

Sensor type	1-Wire DS18B20
Measuring range	-55 to +125 °C
Accuracy	±1 °C

Input AN1, AN2 - voltage measurement

Measuring range	0 – 10 V
Max. input voltage	18 V
Input resistance	207 kΩ typ.
A/D converter	12 bit
Accuracy	±0,5 %

Input AN1, AN2 - current measurement

Measuring range	4 – 20 mA
Max. input current	50 mA
Dynamic inputs impedance	120 Ω typ.
Voltage drop for 20mA	< 2,4 V max.
A/D converter	12 bit
Accuracy	±0,5 %

Binary outputs Q1 – Q4

Output type	transistor "open drain" type
Recommended mean current for a single Output	100 mA
Maximum current for a single Output	250 mA
Output Resistance in ON state	3 Ω max.
Maximum voltage applied	24 V

Binary inputs I1 – I6

Input voltage	30 V
Input resistance	12,7 kΩ typ.
Input voltage ON (1)	>9 V
Input voltage OFF (0)	<3 V

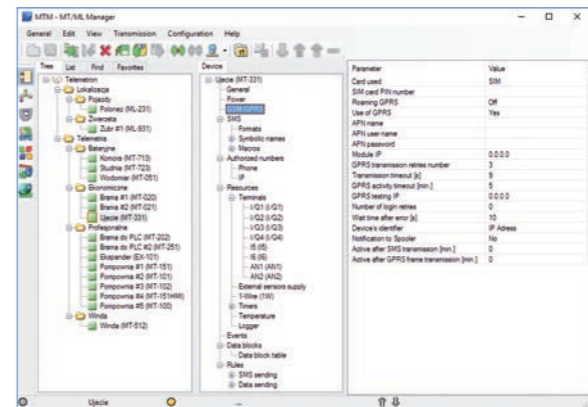
Binary inputs I7 – I8

Input voltage	30 V
Input resistance	15,4 kΩ typ.
Input voltage ON (1)	> 9 V
Input voltage OFF (0)	< 3 V
Minimal pulse length "1"	10 ms

Internal temperature sensor

Measuring range	-25 to +80 °C
Accuracy	±1 °C

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-331 Telemetry module (replaced the whole MT-30X series of economical family modules) is a modern unit equipped in quad band modem uBlox SARA-U201. MT-331 is keeping aluminum housing and attractive price of economical family and offer resources and possibilities that are available in advanced telemetry devices. Configurable modes of inputs/outputs allow to prepare resources for the specific needs of application. Except 2 dedicated binary inputs user can configured additional 4 inputs (also as counter mode) and additional 2 binary inputs (instead of analogue). In control applications that required outputs user can configured 4 channels. Measure functions can be realized by 2 configurable analogue inputs, mode 4–20mA or 0–10V. Built-in Li-ion battery keeps power on in case of lost the main powers supply. Supply output provide a stabilized voltage for external circuits and measurement sensors, also in energy saving mode.

MT-331 Telemetry module is a green line, energy efficient module compatible with renewable energy sources. Energy saving mode supported with internal built-in Li-ion battery allows to connect external battery's as main supply. Device can be also supply directly from solar panels. In energy saving mode the module "goes to sleep" (as in batteries family modules MT-7xx) and wakes up according to configured schedule or occurrence of some events.

Except standard SIM cards (Subscriber Identification Module) the MT-331 used built-in MIM card (Machine Identification Module) which is soldered in packaging mount process of electronics. Depending from preferences user can use:

- Only MIM card, without SIM
- Only SIM card, without MIM activation
- SIM and MIM card (mobile network redundancy).

Module is equipped with flash memory reserved for capacity of 28000 records data logger with maximal resolution of 1 sec. When actual value of register will be saved with 5 minutes period, the logger can stored measured data of 96 days.

With MT-331 module we supplied free of charge applications: MT-Manager and MTC for remote and local configuration, resources monitoring and firmware actualization, MT-Data Provider (OPC server, relation data base data saving engine) for communications environment for Microsoft Windows. These applications allow easy integration with available on the market popular SCADA systems.

Similarly to previous MT-30x family the MT-331 is equipped with stylish aluminum housing with DIN rail connectors. Though the MT-331 is derived from economical Inventia modules series it has got 3 years warranty, like in professional series, and we are sure it will be useful in many professional applications.

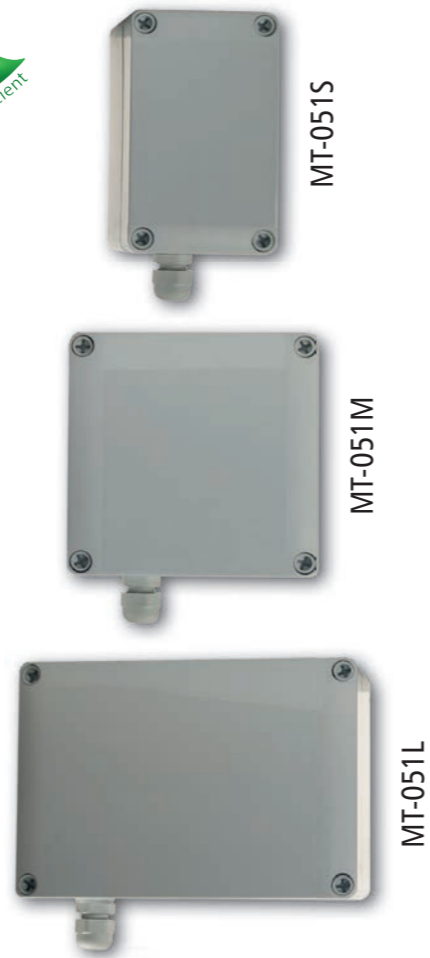
Functionality

- Transmission modes:
 - GPRS/HSPA – packet transmission
 - SMS
- Configurable resources of binary inputs, outputs, counters and analogues
- Data logger with 1 second resolution stored data events in flash memory (capacity 28000 records)
- Remote access to configuration parameters, remote firmware changing
- Configurable access security – IP and Phone list, optional password
- 6 binary inputs can be configured as counters (up to 100 Hz, without analogue inputs)



MT-051 – Battery GSM/GPRS module for alarm systems and remote reading of water meters

- GSM/GPRS packet transmission and SMS messaging
- Integral GSM 850/900/1800/1900 modem with autonomic GPRS network logon system
- 5 binary/counter inputs with support for potential free contacts (e.g. pulse outputs of water meters)
- Intelligent data logger (max. 28 000 records)
- Built-in temperature sensor
- Optional 1-wire port for external temperature sensor
- Configurable events and schedules initiating measurements and data transmission
- Reed relay for waking up with magnet without opening of the case
- Real Time Clock
- Internal 4.5 VDC alkaline battery pack (S - 3xLR20, M - 6xLR20 or L - 9xLR20) – support for optional 3 VDC and 3,6 VDC lithium packs
- Intelligent power management
- USB port for local configuration
- IP67 enclosure
- Conformal coating for electronics
- -20° to +60°C operating temperature
- Internal GSM antenna or optional SMA connector for external antenna
- User friendly configuration tools and communication driver (OPC and RDB support)
- Support for GPRS based remote management and firmware update



The MT-051 is a battery operated telemetry module optimized for use in alarm systems and flow measuring applications (Automated Meter Reading) where power lines are not available and environmental conditions are harsh (dust, high humidity). MT-051 module is a data logging and transmitting device with the high degree of ingress protection. Like other modules from MT family MT-051 module is a cutting edge design characterized by technological advancement, innovative solutions, ease of configuration and integration with data gathering and processing systems. Module has possibility of initiating data transmission (event-driven or scheduled) what helps to minimize the transmission costs and energy consumption, therefore increasing battery life. Robust, compact design enclosed in a polycarbonate housing with IP67 protection allows installation and usage of module in places with harsh environment and without power supply (such as water meter pits). The module is powered from alkaline battery packs (optional lithium battery packs). Enclosure dimension indicates nominal capacity of the battery packs (S size - 3xLR20, M size - 6xLR20, L size - 9xLR20). Voltage level of power source is monitored and transmitted together with measurement data.

MT-051 module is equipped with 5 binary/counter inputs (supporting potential free contacts e.g. pulse outputs of water meter). The MT-051 is compatible with intelligent water meter sensors providing total flow, compensated flow, flow direction, magnetic tampering and cable cut detection signals. The module ensures extremely low power consumption by deactivation of GSM/GPRS modem when there is no data transmission. Measurement data can be recorded in non-volatile Flash memory with precise time stamps. The module is supplied with user-friendly configuration environment and communication driver providing OPC, ODBC and CSV interfaces for data acquisition, and the software for remote management via GPRS, including remote configuration and firmware upgrade.

General

Dimensions (H x W x D) in mm:	
MT-051 S (3 alkaline batteries)	75 x 125 x 75
MT-051 M (6 alkaline batteries)	125 x 125 x 75
MT-051 L (9 alkaline batteries)	175 x 125 x 75
Weight (with batteries)	depends on enclosure size and type of battery pack
Mounting method	4 holes
Operating temperatures	-20°C to +60 °C
Protection class	IP67

GSM/GPRS Modem

Modem type	u-blox LEON-G100
GSM	quad-band (850/900/1800/1900)
GPRS	Class 10
Frequency range:	
GSM 850 MHz	Transmitter: 824MHz – 849 MHz Receiver: 869 MHz – 894 MHz
EGSM 900 MHz	Transmitter: 880 MHz – 915 MHz Receiver: 925 MHz – 960 MHz
DCS 1800 MHz	Transmitter: 1710 MHz – 1785 MHz Receiver: 1805 MHz – 1880 MHz
PCS 1900 MHz	Transmitter: 1850 MHz – 1910 MHz Receiver: 1930 MHz – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) – class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) – class 1 station
Antenna	50 Ω

Power

Alkaline battery pack:	
S size (height of enclosure: 75mm)	3 alkaline batteries, 4.5 V/16 Ah
M size (height of enclosure: 125mm)	6 alkaline batteries, 4.5 V/32 Ah
L size (height of enclosure: 175mm)	9 alkaline batteries, 4.5 V/48 Ah
Mean current consumption with active GSM modem	20 mA (without GPRS transmission)

Maximum frequency of counted pulses	Sleep mode current consumption	
	Typical	Maximum
8 Hz	50 μA	75 μA
256 Hz	150 μA	200 μA

Binary/pulse inputs I1 – I5

Contacts polarization	2,8 V
Counting frequency (pilot duty 50%)	250 Hz max.
Minimal pulse length – operating in pulse input mode	2 ms
Minimal pulse length – operating in binary input mode	2 ms

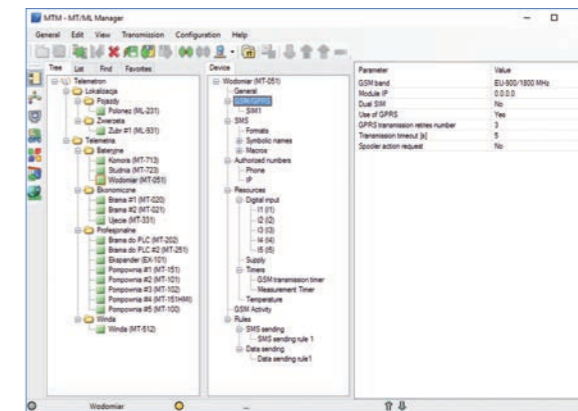
Logger

Memory type	FLASH
Capacity in records	28000

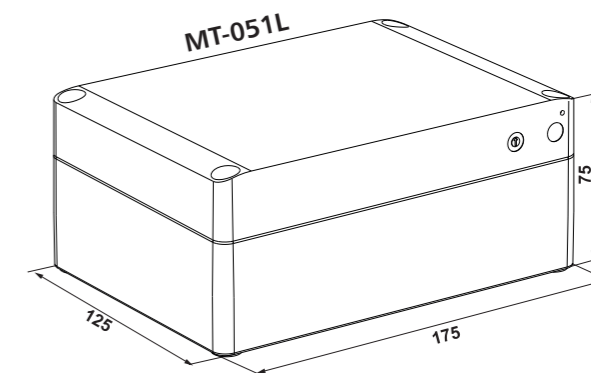
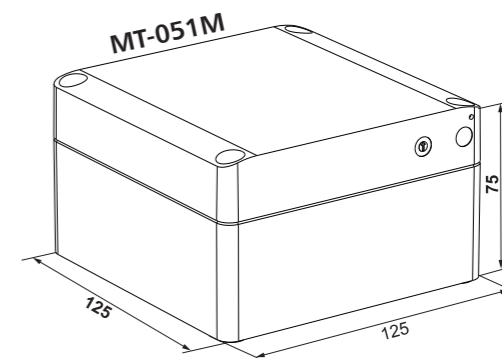
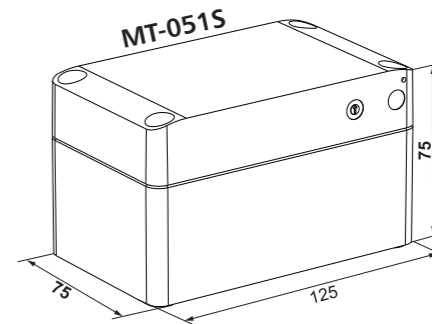
Additional features

Dual SIM	standard SIM and micro SIM/MIM
Internal temperature sensor	Accuracy: ±1°C @ -25°C do +100 °C
Port for external temperature sensor 1-Wire DS18B20	Accuracy: ±0,5°C @ -10°C do +85 °C ±2°C @ -55°C do +125 °C

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



WARRANTY
3
YEARS

MIM

energy efficient

SMS



5DI/0DO



IP67

MT-051

MT-051

MT-713 v2 – Battery powered, energy saving GPRS telemetry module

- GSM/GPRS packet transmission and SMS
- Integral GSM 850/900/1800/1900 with system for autonomic login to GPRS network
- 5 binary/counter inputs compatible with potential free contacts (eg. pulse outputs of flowmeters)
- 3 analogue 0-5 V DC inputs with configurable alarm thresholds and hysteresis
- 2 binary outputs
- Keyed power supply 0-5 V DC and 15/24 ** for external analogue converters
- Optional power supply 15/24VDC for external analogue converters
- Lid opening sensor (tampering protection)
- Measuring of internal temperature
- Intelligent data logger (4/8MB Flash RAM with min. write interval of 1 sec.)
- Configurable schedules and events initiating measurements and data transmission
- RTC real time clock
- Battery power supply (alkaline or lithium batteries), replaceable
- Optimal external supply
- 32 elements array with logic functions (OR, AND, XOR, NOP, END)
- Intelligent power management
- USB port for local configuration
- Optional communication interface (RS-485)
- Optional GPS receiver



- IP-67 enclosure
- SMA antenna socket
- Operating temperature range -20° to +55°C
- User friendly communication and configuration software
- GPRS based application for remote management
- Remote firmware upgrade

MT-713 is a new generation of battery powered measuring, logging and transmitting device. Like other modules of MT family the module is a cutting edge design characterized by advanced innovative solutions, easy to configure and integrate with data collecting and processing systems. The spontaneous on event-based or scheduled data transmission helps to minimize energy consumption and transmission costs extending battery life time. Simple compact design in plastic enclosure with IP-67 protection makes the module ideal for harsh environment with no power lines (eg. water supply control wells and chambers). Integrated replaceable battery set may endure even for 10 years of operation (lithium batteries in conjunction with power saving configuration).

Battery voltage is continuously monitored and reported along with measurement data. MT-713 is equipped with 5 binary/counter inputs (adopted to work with potential free contacts) and 3 analogue inputs allowing measuring of parameters like pressure, temperature, level etc. Keyed voltage source powering analogue inputs for measurement interval only and binary outputs capable to control power

supply of external sensors in conjunction with deactivation of GSM/GPRS modem reduces energy consumption to absolute minimum. Measurement data may be logged with precise time stamp in non volatile Flash memory according to configured schedule or on event. Besides measurements the module can report multiple alerts: tampering with enclosure, unauthorized opening of the chamber, long period of missing flow, crossing of predefined level or temperature threshold etc. MT-713 module's resources and functionality may be optimized for particular applications due to many available options (3 or 6* lithium or alkaline battery packs, internal antenna, opaque cover, communication interface for external devices, GPS receiver). User friendly environment for configuration, communication with open interfaces for OPC/ODBC/CSV and remote management comes along with the purchased module, free of charge. The user may fully benefit from new versions of firmware thanks to remote firmware upgrade functionality.

* in MT-713 HC with deeper enclosure
** option

General

Dimensions (HxWxD)	122 x 120 x 65 (95)* mm
Weight (with batteries)	1030 (1430)* g
Mounting type	4 holes
Operating temperature	-20 to +55 °C
Protection class	IP67 (IP68 optional)

Modem GSM/GPRS

Modem type	SIERRA WIRELESS
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824MHz – 849 MHz Receiver: 869 MHz – 894 MHz
EGSM 900	Transmitter: 880 MHz – 915 MHz Receiver: 925 MHz – 960 MHz
DCS 1800	Transmitter: 1710 MHz – 1785 MHz Receiver: 1805 MHz – 1880 MHz
PCS 1900	Transmitter: 1850 MHz – 1910 MHz Receiver: 1930 MHz – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) – class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) – class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power supply

Battery pack:	
- 3 alkaline batteries (6 alkaline batteries)*	4,5 V/16 Ah (32 Ah)*
or	
- 3 lithium batteries (6 lithium batteries)*	3,6 V/39 Ah (78 Ah)*
Mean modem sleep current	250 μA typ.
Current consumption with GSM active and no transmission	50 mA typ.
Current consumption during GPRS transmission**	250 mA typ.

* in MT-713 HC with deeper enclosure
** weak GSM signal level or unmatched antenna can increase current consumption during transmission significantly.

Analogue inputs AN1 – AN3 (potential, differential)

Measuring range	0 – 5,0 V
Input resistance	>600 kΩ typ.
Resolution	12 bit
Accuracy	± 0,5 %

Binary/counter inputs I1 – I5

Contact polarization	3 V
Counting frequency	250 Hz max.
Minimum pulse length	2 ms

NMOS Q1, Q2 outputs

Maximum voltage	30 V
Maximum current	250 mA
Switch off current	< 50 μA
Resistance	1Ω

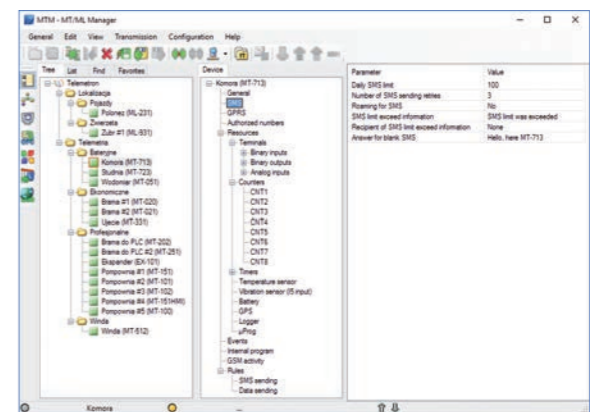
Configurable voltage output

Voltage range	0 – 5,0 V
Resolution	0,1 V
Accuracy	2 %
Maximum current	50 mA

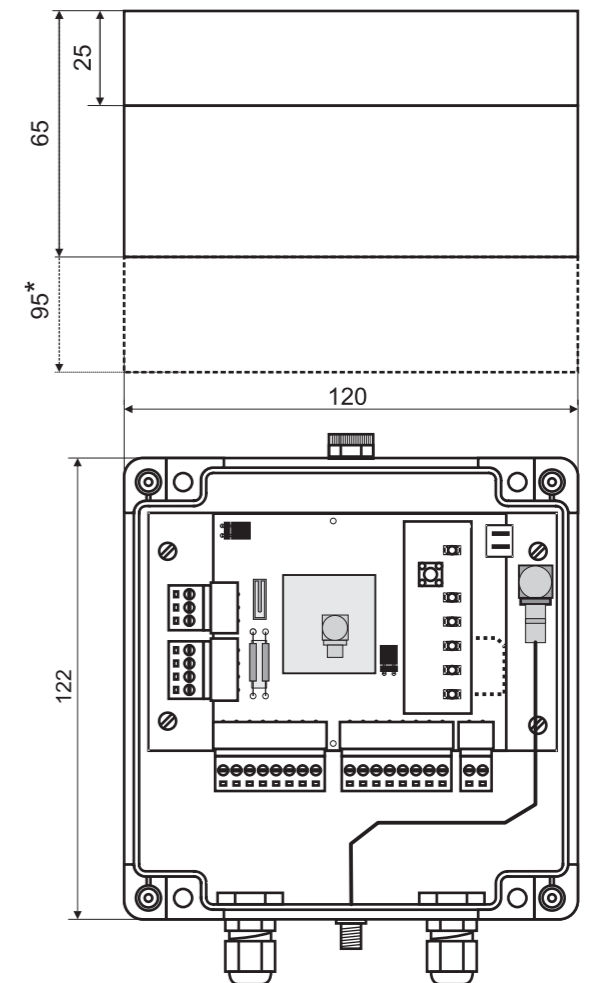
Logger

Memory type	FLASH
Memory capacity	4 MB
Minimum recording interval	1 s

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-713 v2



5DI/2DO

3AI



RS-485 option

MT-723 – Energy efficient IP68 data logger with SMS/GPRS communication

- GSM /GPRS packet transmission and SMS messaging
- Integral GSM 850/900/1800/1900 modem with autonomic GPRS network logon system
- 6 binary/5 counter inputs with support for potential free contacts (e.g. for connecting water meters pulse outputs)
- 3 analog 0–5 VDC inputs with configurable alarm thresholds and hysteresis
- 2 controlling outputs
- Keyed 0–5 VDC power supply for external analog converters
- Vibration sensor (detection of intrusion)
- Optional flooding sensor
- Optional built-in pressure transducer
- Intelligent data logger (4 MB Flash memory – max. 10 000 records)
- Configurable events and schedules initiating measurements and data transmission
- Real Time Clock
- 7–30 VDC power supply (alkaline or lithium batteries, rechargeable batteries, solar panel, DC power supply)
- Intelligent power management
- USB port (IP68) for local configuration
- IP68 enclosure and connectors, electronics covered by protective gel
- Measure of energy used
- Optional GPS receiver
- SMB IP68 antenna connector



- -20° to +60°C operating temperature
- User friendly communication and configuration applications
- Support for GPRS based remote management and firmware update

MT-723 module is a data logging and transmitting device with the highest degree of protection against harsh external environment. Like other modules from MT family MT-723 module is a cutting edge design characterized by technological advancement, innovative solutions, ease of configuration and integration with data gathering and processing systems. Module has possibility of initiating data transmission (event-driven or scheduled) what helps to minimize the transmission costs and energy consumption, therefore increasing battery life. However it is possible to set up device to stay online permanently or for desired time thus allowing to poll both current, logged or both types of data asynchronously from module. Robust, compact design enclosed in a polycarbonate housing with IP68 protection module allows installation and usage of module in places with harsh environment and without power supply (such as water supply network measuring chambers). The module can be powered from alkaline or lithium battery packs, batteries, solar panels as well as from stationary sources of power. Voltage level of power source is constantly monitored and transmitted together with measurement data. In the case of disconnection of an external power supply internal lithium battery provides power essential for counting pulses on inputs I1 – I6, sustains the RTC clock and triggers power loss alarm. MT-723 module is equipped with 6

binary/counter inputs (supporting potential free contacts used e.g. as pulse outputs of water meters) and three analog inputs for measuring parameters such as pressure, temperature, water level, etc. Keyed voltage source for powering analog sensors which provides power only for a short time needed for measurement and outputs that can be used for controlling external power source powering analog sensors are solutions which, in conjunction with the deactivation of GSM/GPRS modem when there is no data transmission, ensure an extremely low power consumption. Measurement data is stamped with precise time and can be recorded in nonvolatile Flash memory. In addition to measuring functions module can also report states of emergency such as mechanical shock, flooding, unauthorized opening of the chamber, lack of flow, exceeding specified level of flow, pressure, water level, temperature, humidity, etc. Resources and functionality of the MT-723 module can be optimized for specific applications thanks to the many available options (module flooding sensor, pressure transmitter, GPS receiver). The module is supplied with userfriendly configuration environment and communication driver providing OPC, ODBC and CSV interfaces for data reception and the software for remote management via GPRS. User can manage modules from remote via GPRS. Remote management includes firmware updates.

General

Dimensions (length x width x height)	80 x 140 x 65 mm
Weight	600 g
Mounting type	4 holes
Operating temperature	-20 to +60°C
Protection class	IP68

GSM/GPRS Modem

Modem type	SIERRA WIRELESS
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824MHz – 849 MHz Receiver: 869 MHz – 894 MHz
EGSM 900	Transmitter: 880 MHz – 915 MHz Receiver: 925 MHz – 960 MHz
DCS 1800	Transmitter: 1710 MHz – 1785 MHz Receiver: 1805 MHz – 1880 MHz
PCS 1900	Transmitter: 1850 MHz – 1910 MHz Receiver: 1930 MHz – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) – class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) – class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power

Power voltage range	7 – 30 VDC
Medium current in sleep mode (for 12 V)	< 250 μA
Medium current when transmitting data (for 12 V)	25 mA
Maximum peak current when transmitting data (for 12 V)	500 mA

Analogue inputs AN1 – AN3 (potential, differential)

Measuring range	0 – 5,0 V
Input resistance	>600 kΩ typ.
Resolution	12 bits
Accuracy in full operating temperature range	± 0,3 %
Accuracy in 25°C	± 0,1 %

Binary inputs I1 – I6/counter inputs C1 – C5

Contact polarization	3 V
Counting frequency for counter inputs	250 Hz max.
Minimal pulse length for counter inputs	2 ms
Minimal pulse length for binary inputs	0,1 s

NMOS outputs Q1, Q2

Maximum voltage	30 V
Maximum current	250 mA
Switch off current	< 50 μA
Resistance	1Ω

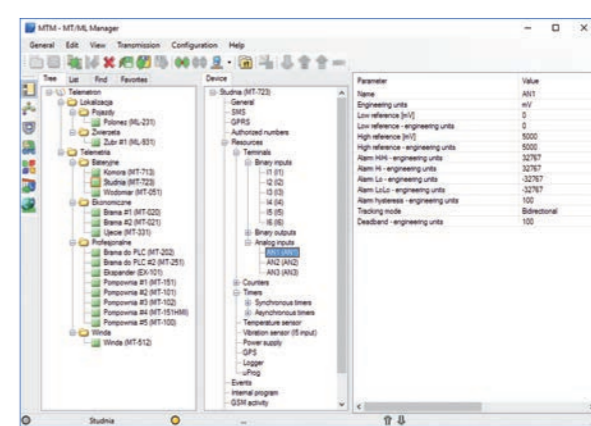
Logger

Memory type	FLASH
Memory size	4 MB (10 000 records)
Minimum recording interval	1 s

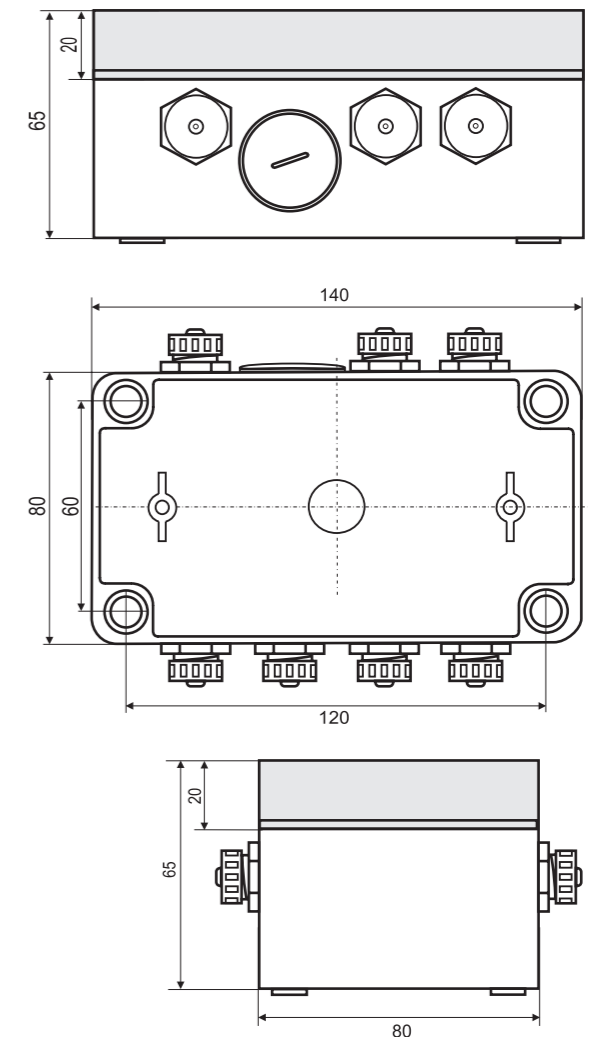
Configurable voltage output

Voltage range	0 – 5,0 V
Resolution	0,1 V
Accuracy	2 %
Maximum current	50 mA

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



WARRANTY
3
YEARS

energy efficient

SMS

GPS
option



6DI/2DO

3AI



IP68

MT-723

MT-723

MT-723 PT – Energy saving IP-68 logger with integrated pressure gauge

- SMS and GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem with autonomous GPRS login procedures
- 6 binary/counter inputs for potential free contacts (for instance, pulse outputs from flow meters)
- 2 analogue inputs 0–5 VDC with configurable alarm thresholds and hysteresis
- Built in pressure gauge 0 – 10 Bar (other ranges optional)
- 2 controlling outputs
- Latched 0-5 VDC voltage supply for external analogue sensors
- Shock sensors (detecting intrusion)
- Intelligent data logger (4 MB Flash memory – max. 10 000 records)
- Configurable schedules and events initiating measurements and data transmission
- Real Time Clock RTC
- External power supply 7–30 VDC (alkaline or lithium batteries, accumulators, solar panels, permanent supply)
- Intelligent power management
- USB Port (IP68) for local configuration
- IP68 cabinet and connectors, circuits molded in protective gel
- Optional GPS receiver
- SMB IP-68 antenna socket



- Operating temperature -20° to +60°C
- Intuitive, user friendly configuration and communication applications.
- Application for remote control via GPRS network
- Remote firmware updates

MT-723 PT logger and transmission module has highest grade of protection in harsh environment. As other modules of MT family it is known for innovative design, advanced technologies and for ease of configuration and integration in data collection and processing systems. Spontaneous data transmission on event occurrence allow minimizing transmission costs and energy consumption thus prolonging battery life time. However it is possible to set up device to stay online permanently or for desired time thus allowing to poll both current, logged or both types of data asynchronously from module. Simple, robust design enclosed in polycarbonate housing with IP-68 ingress protection class allows installation in harsh environment where there is no supply of electricity (like for instance water supply systems measuring chambers).

The module may be powered from alkaline batteries, lithium batteries, lead batteries, solar panels or from power lines.

The level of power supply is constantly monitored and reported along with measurement data. Internal lithium battery secures pulse counting on inputs I1–I6 secures RTC clock function and alarm transmission in case of main supply failure.

MT-723 PT is equipped with: 6 binary/counter inputs (adapted to work with potential free contacts for water consumption meter), 2 analogue inputs allowing measuring various parameters like pressure, temperature, level, humidity. The module has a pressure gauge with quick coupling allowing comfortable connection with pressure hose. Extremely low power consumption is achieved by deactivating GPRS/GSM modem when not transmitting and using latched power supply output for external analogue sensors or for controlling power supply to external equipment only for measuring time. Measurement data may be registered with precise time stamp in non volatile Flash memory either by schedule or on event.

The module can beyond measuring issue alerts in case of mechanical shock, submersion, unauthorized chamber opening, lack of flow, too high flow, high pressure, high level, temperature, humidity etc.

The configuration environment and communication application with open OPC/ODBC/CSV interfaces and an application for remote management via GPRS network comes free of charge with the purchase of the module. The user may unrestricted use new firmware versions thanks to capability of remote upgrading.

General

Dimensions (length x width x height)	80 x 170 x 65 mm
Weight	870 g
Mounting type	4 holes
Operating temperature	-20 to +60 °C
Protection class	IP68

GSM/GPRS Modem

Modem type	SIERRA WIRELESS
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824MHz – 849 MHz Receiver: 869 MHz – 894 MHz
EGSM 900	Transmitter: 880 MHz – 915 MHz Receiver: 925 MHz – 960 MHz
DCS 1800	Transmitter: 1710 MHz – 1785 MHz Receiver: 1805 MHz – 1880 MHz
PCS 1900	Transmitter: 1850 MHz – 1910 MHz Receiver: 1930 MHz – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) – class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) – class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power

Power voltage range	7 – 30 VDC
Average current in sleep mode (for 12 V)	< 250 μA
Average current when transmitting data (for 12 V)	25 mA
Maximum peak current when transmitting data (for 12 V)	500 mA

Analog inputs AN1 – AN3 (voltage, differential)

Measuring range	0 – 5,0 V
Input resistance	>600 kΩ typ.
Resolution	12 bits
Accuracy in full operating temperature range	± 0,3 %
Accuracy in 25°C	± 0,1 %

Integrated pressure gauge AN1

Measurement range	0 – 10 Bar
Temperature of medium	0 – 80 °C
Accuracy	0,5 %

Binary inputs I1 – I6/counter inputs I1 – I5

Contact polarization	3 V
Counting frequency for counter inputs	250 Hz max.
Minimal pulse length for counter inputs	2 ms
Minimal pulse length for binary inputs	0,1 s

NMOS outputs Q1, Q2

Maximum voltage	30 V
Maximum current	250 mA
Switch off current	< 50 μA
Resistance	1Ω

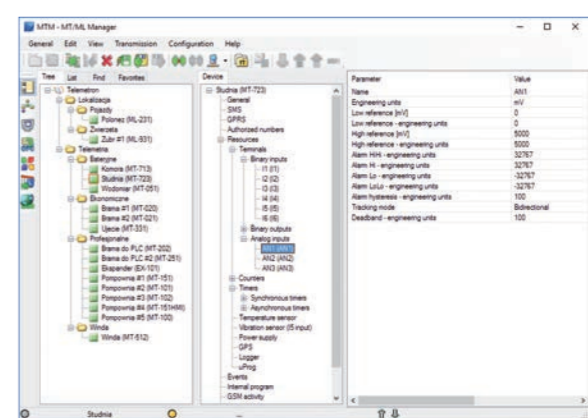
Configurable voltage output

Voltage range	0 – 5,0 V
Resolution	0,1 V
Accuracy	2 %
Maximum current	50 mA

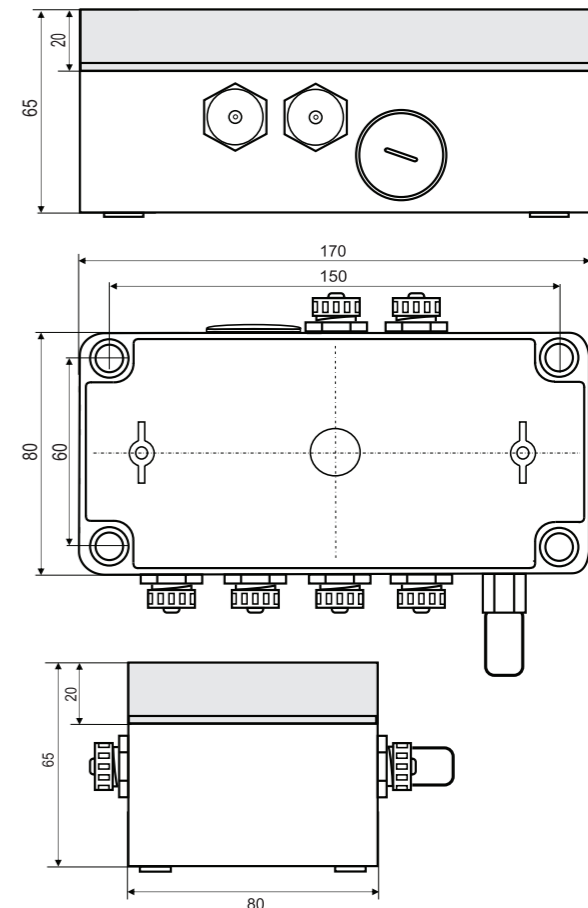
Logger

Memory type	FLASH
Memory size	4 MB (10 000 records)
Minimum recording interval	1 s

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



6DI/2DO

2AI

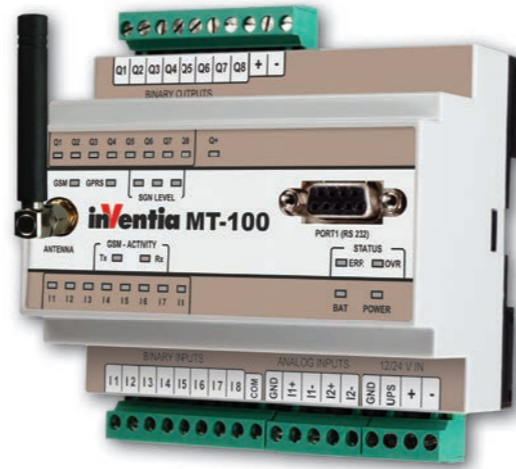


MT-723 PT

MT-723 PT

MT-100 – Telemetry module for on-line monitoring and local control

- GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem with automatic login onto GPRS network
- Optoisolated binary inputs and outputs (8...16/8...0)
- Optoisolated analog inputs 4-20 mA (2)
- Data logger with 0.1 sec. resolution
- Programmable PLC controller (100 lines of code)
- Removable terminal blocks
- Diagnostic LED diodes
- Remote configuration, programming and firmware update
- RS-232



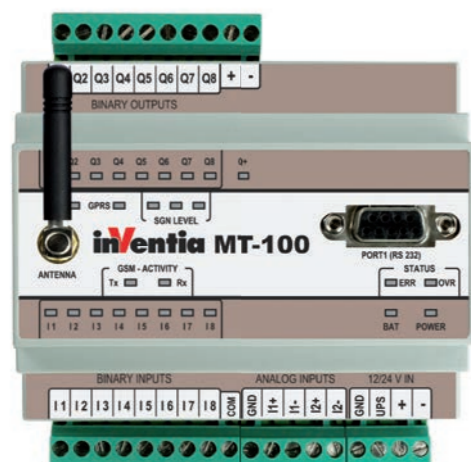
MT-100 module offers ultimate price/feature ratio. It has the same, known for high quality, input/output resources as MT-101. It lacks only the communication port and buttons for manual setting alarm thresholds. PLC functionality allows creating programs up to 100 lines of code. With price set at the same level as for MT-3XX economic series of telemetry modules, MT-100 is a perfect choice for applications where advanced features of MT-101 module are not necessary, but the same level of reliability (3-year-warranty) is expected. MT-100 connectors are compatible with MT 101 allowing easy product migration over time, when more sophisticated programs or local communication with external devices is required.

Resources

- 8 optoisolated binary/counter inputs 24V DC (I1–I8), both negative and positive logic
- 8 configurable binary outputs/inputs /counter inputs 24V DC (Q1–Q8)
- 2 optoisolated analog inputs 4 20 mA (10 bit res.) with configurable hysteresis and filtration
- Internal flags, markers and registers available to usage within user program
- Flash memory containing device firmware with possibility of remote update via GPRS
- RTC clock with possibility of both automatic synchronization with GSM provider time and remote configuration with PC time

Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
- All binary inputs can be configured as counters or frequency-to-analog converters (0-2kHz)
- Functionality of programming logical functions using I/Os, registers, flags and markers triggering data transmission or SMS sending, e.g. sending alarm SMS when alarm threshold of analog input is reached
- Dynamic inserting variable text (registers values, flag states, I/O values) into SMS
- Unsolicited messaging
- Event triggered Data Logger with 100ms resolution
- Simple, multipoint alarm configuration for both binary and analog inputs (4 alarm levels)
- Local or remote (via GPRS) configuration and programming
- Configurable security access - IP and Phone lists, optional password
- DIN rail mounting
- 12/24 VDC power supply voltage
- Detachable terminal blocks
- Reach diagnostic LEDs (status, GSM transmission activity, GSM signal level, GPRS activity, I/Os status)
- User-friendly software tools
- OPC/CSV/ODBC server for Windows operating systems



General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting type	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40
Max. voltage at all connectors relative to device's GND.	60 Vrms max.

GSM/GPRS Modem

Modem type	CINTERION TC63i
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824 – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880 – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710 – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 1930 – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) - class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) - class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power supply

Voltage range (DC)	9 – 30 V		
Input current (A) (for 12 V DC)	Idle	Active	Max
	0,07	0,40	1,90
Input current (A) (for 24 V DC)	Idle	Active	Max
	0,04	0,18	1,00

Binary inputs I1 – I8

Maximum input voltage	-36 – 36 V
Input resistance	5,4 kΩ
Input voltage ON	> 9 V lub < -9 V
Input voltage OFF	-3 – 3 V

Binary outputs Q1 – Q8

Maximum input voltage	36 V
Input resistance	5,4 kΩ tzp.
Input voltage ON	> 9 V min
Input voltage OFF	< 3 V max.

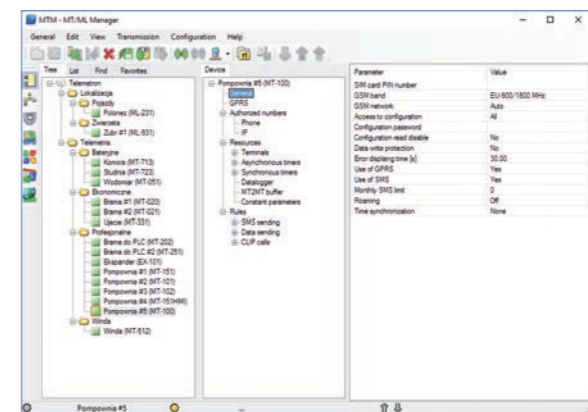
Outputs Q1 – Q8

Recommended average current for single output	50 mA
Maximum current for single output	350 mA max.
Mean current for all outputs	400 mA max.
Voltage drop at 350 mA	< 3,5 V max.
Off state current	< 0,2 mA max.
Max. operating voltage	36 V

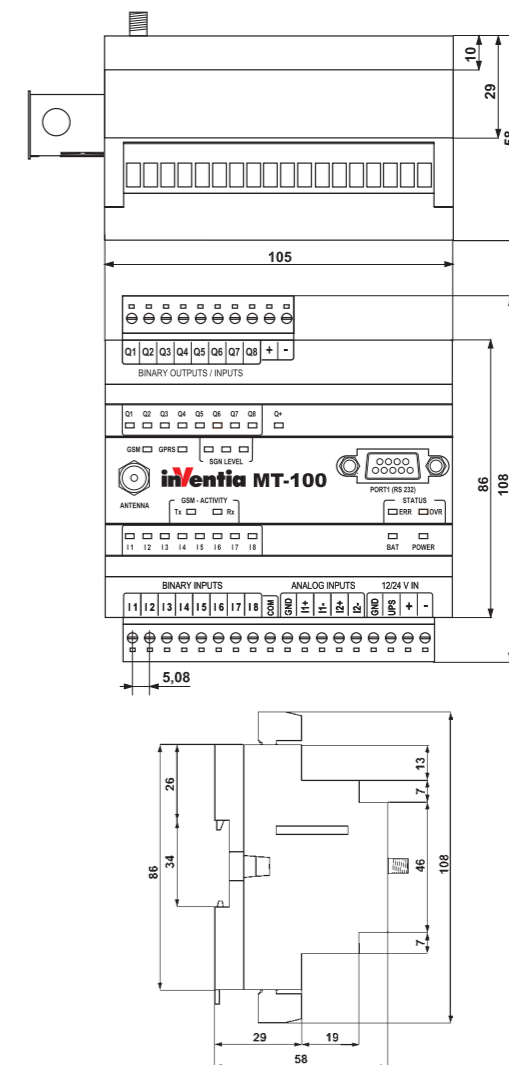
Analog inputs AN1, AN2 (4–20 mA)

Measurement range	4 – 20 mA
Maximum input current	50 mA max.
Input dynamic impedance	25 Ω typ.
Voltage drop at 20mA	< 5 V max.
A/D converter resolution	10 bit
Accuracy	± 1,5 % max.
Nonlinearity	± 1 % max.

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



8-16DI / 0-8DO

2AI



DIN RAIL

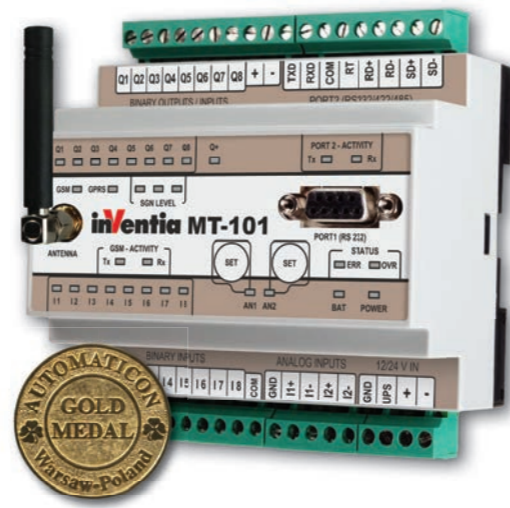
RS-232

MT-100

MT-100

MT-101 – Telemetry module for on-line monitoring and local control

- GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem with automatic login onto GPRS network
- Binary inputs and outputs
- Analog inputs 4-20 mA (2)
- Serial communication port for external devices (RS 232/422/485), isolated
- Data logger with 0,1 sec. resolution
- RTC Real Time Clock
- Programmable logic controller (PLC)
- Standard communication protocols (MODBUS RTU, GAZMODEM, M-BUS, NMEA 0183)
- Removable terminal blocks
- Easy configuration software
- FlexSerial mode for program based protocol handling



Telemetry Module MT-101 is a professional device combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network.

Compact, robust design, integral GSM modem, attractive technical features and easy to use configuration tools are important advantages of MT-101 in wireless, scalable, multinode systems for telemetry, control, diagnostic, surveillance and alarming.

Resources

- 8 optoisolated binary / counter inputs 24V DC (I1 – I8)
- 8 configurable binary outputs / inputs / counters 24V DC (Q1 – Q8)
- 2 optoisolated analog inputs 4 – 20 mA (8 bit acc./10 bit res.) with configurable hysteresis and filtration
- Isolated serial port RS 232/485/422
- Firmware Flash memory with remote update capability
- RTC with external synchronization functions

Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
 - CSD - circuit switched data transmission (in modem mode only)
- All binary inputs can be configured as counters or frequency-to-analog converters (0-2kHz)
- Programmable control functions using I/O's and configurable, event triggered flags (SMS sending, data sending / logging, output control, call in)
- Unsolicited messaging
- Event triggered Data Logger
- Dynamic SMS text insertion
- Simple, multipoint alarm configuration for both binary and analog inputs
- Additional manual alarm level setting capability for analog inputs A1, A2 (front panel push buttons)
- External, optoisolated RS 232/422/485 serial port for data transmission
- Serial port emulated protocols in GPRS mode:
 - MODBUS RTU (Master and Slave)
 - Transparent, intelligent modem
- Smart MODBUS RTU routing
- Multibroadcast for transparent mode
- Local or remote (via GPRS) configuration and programming
- Configurable access security – IP and Tel. list, optional password
- DIN rail mounting
- Power supply 12/24 V DC, 24 V AC
- Removable terminal blocks
- Diagnostic LED's (status, GSM transmission activity, GSM signal level, GPRS activity, serial communication activity, I/O status)



General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting type	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40
Max. voltage at all connectors relative to device's GND.	60 Vrms max.

GSM/GPRS Modem

Modem type	CINTERION TC63i
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824 – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880 – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710 – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 1930 – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) - class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) - class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power supply

Voltage range (DC) 12, 24V	10,8 – 36 V		
AC (24V)	18 – 26,4 Vrms		
Input current (A) (for 12V DC)	Idle	Active	Max
	0,10	0,60	1,90
Input current (A) (for 24V DC)	Idle	Active	Max
	0,06	0,25	1,00

Inputs I1 – I8

Input voltage range	-36 – 36 V
Input resistance	5,4 kΩ
Input voltage ON (1)	> 9 V or < -9 V
Input voltage OFF (0)	-3 V – 3 V

Inputs Q1 – Q8

Maximum input voltage	36 V
Input resistance	5,4 kΩ tzp.
Input voltage ON	>9 V min
Input voltage OFF	<3 V max

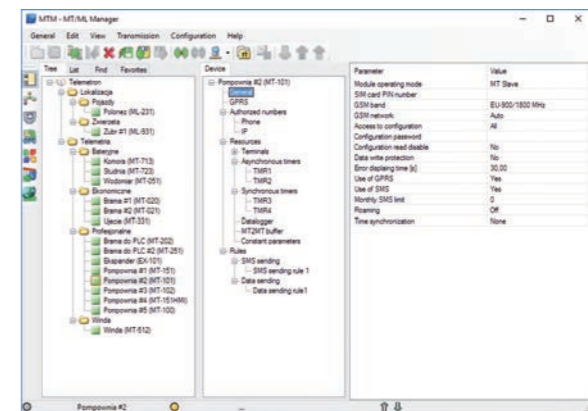
Outputs Q1 – Q8

Recommended average current for single output	50 mA
Single output current	350 mA max.
Mean current for all outputs	400 mA max.
Voltage drop at 350 mA	< 3,5 V max.
Off state current	<0,2 mA max.
Max. operating voltage	36 V

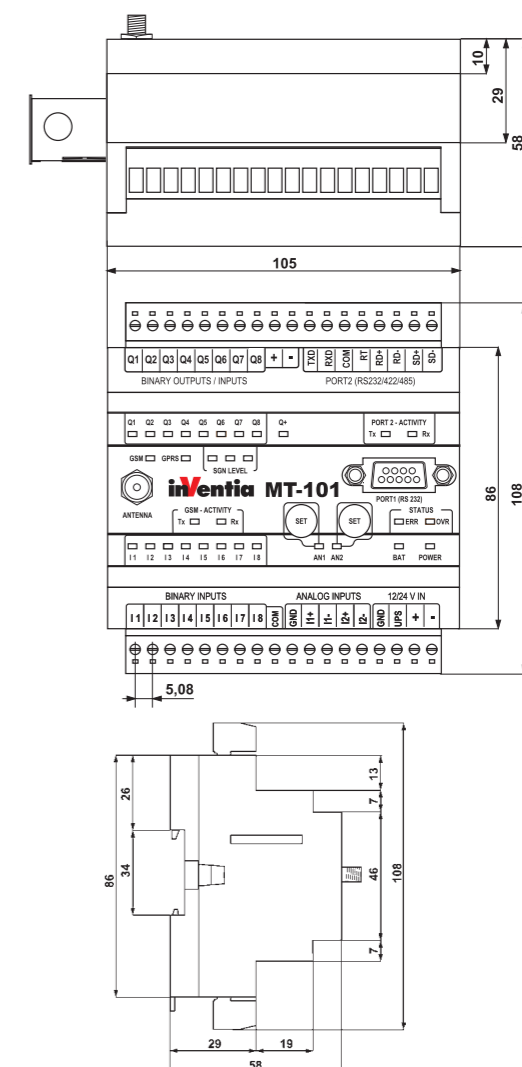
Analog inputs AN1, AN2 (4 – 20 mA)

Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	25 Ω typ.
Voltage drop at 20mA	< 5 V max.
A/D converter	10 bit
Accuracy	± 1,5 % max.
Nonlinearity	± 1 % max.

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



8-16DI / 0-8DO

2AI



DIN RAIL

RS-232

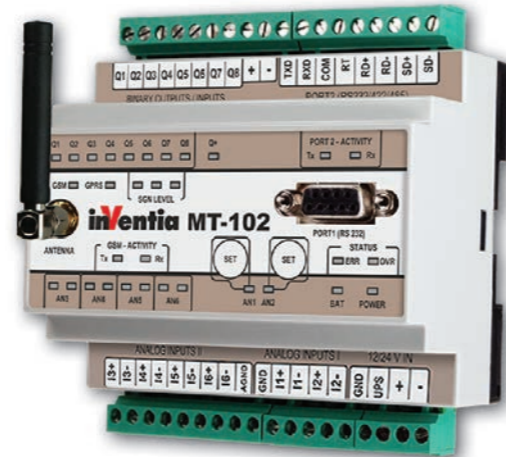
RS-232/422/485

MT-101

MT-101

MT-102 – Telemetry module for on-line monitoring and local control

- GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem with automatic login onto GPRS network
- Binary inputs and outputs (8)
- Analog inputs 4-20 mA (6)
- Serial communication port for external devices (RS-232/422/485), isolated
- Data logger with 0,1 sec. resolution
- RTC Real Time Clock
- Programmable logic controller (PLC)
- Standard communication protocols (MODBUS RTU, GAZMODEM, M-BUS, NMEA 0183)
- Removable terminal blocks
- Easy configuration software
- FlexSerial mode for program based protocol handling

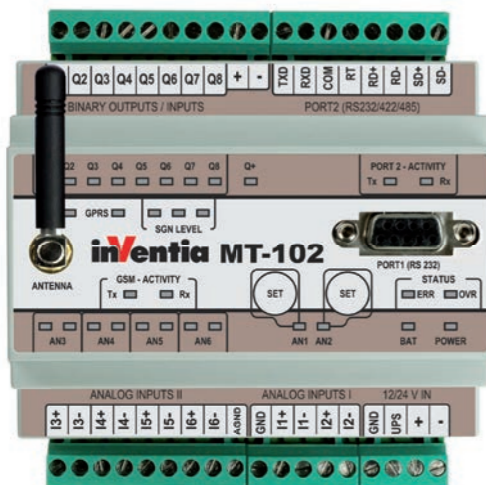


Telemetry Module MT-102 is a professional device combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network.

Compact, robust design, integral GSM modem, attractive technical features and easy to use configuration tools are important advantages of MT-102 in wireless, scalable, multinode systems for telemetry, control, diagnostic, surveillance and alarming.

Resources

- 8 configurable binary outputs / inputs / counters 24 V DC (Q1 – Q8)
- 2 optoisolated fast analog inputs 4-20 mA (1,5 % acc./ 10 bit res.) with configurable hysteresis and filtration
- 4 optoisolated analog inputs 4-20 mA with configurable hysteresis and conversion time (U/f conversion, accuracy 0,5%)
- Internal registers, flags and constants available to internal user program
- Isolated serial port RS-232/485/422
- Firmware Flash memory with remote update capability
- RTC with external synchronization functions



Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
 - CDS - circuit switched data transmission (in modem mode only)
- All internal resources accessible with standard Modbus RTU protocol
- Intelligent packet routing and Multimaster in Modbus RTU mode
- Packet broadcasting or intelligent routing in transparent mode
- All binary inputs configurable as counters or frequency-to-analog converters (0 – 2 kHz)
- Programmable control functions using I/O's and configurable, event triggered flags (SMS sending, data sending / logging, output control, call in)
- Unsolicited messaging on input/flag change, analog signal alarm level crossing or logical function evaluation.
- Event triggered Data Logger
- Dynamic SMS text insertion
- Simple, multipoint (4) alarm configuration for both binary and analog inputs
- Additional manual alarm level setting capability for analog inputs A1, A2 (front panel push buttons)
- Serial port emulated protocol in GPRS mode:
 - MODBUS RTU (Master and Slave)
 - Transparent, intelligent modem
- External module resource mapping to internal registers for data transmission improvement and event triggering
- Multibroadcast for transparent mode
- Remote (via GPRS) configuration and programming
- Configurable access security - IP and Tel. list , optional password
- DIN rail mounting
- Power supply 12/24V DC, 24 V AC
- Removable terminal blocks
- Diagnostic LED's (status, GSM transmission activity, GSM signal level, GPRS activity, serial communication activity, I/O status)

General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting type	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Protection class	IP40
Max. voltage at all connectors relative to device's GND.	60 Vrms max.

GSM/GPRS Modem

Modem type	CINTERION TC63i
GSM	Quad Band (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824 – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880 – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710 – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 1930 – 1990 MHz
Transmitter peak power GSM850/EGSM900	33 dBm (2W) - class 4 station
Transmitter peak power DCS1800/PCS1900	30 dBm (1W) - class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50Ω

Power supply

Voltage range (DC) 12, 24V	10,8 – 36 V		
AC (24V)	18 – 26,4 Vrms		
Input current (A) (for 12V DC)	Idle	Active	Max
	0,10	0,60	1,90
	0,06	0,25	1,00
Input current (A) (for 24V DC)	Idle	Active	Max
	0,06	0,25	1,00
	0,06	0,25	1,00

Inputs Q1 – Q8

Input voltage range	36 V
Input resistance	5,4 kΩ t.zp.
Input voltage ON (1)	>9 V min
Input voltage OFF (0)	<3 V max.

Outputs Q1 – Q8

Recommended average current for single output	50 mA
Single output current	350 mA max.
Mean current for all outputs	400 mA max.
Voltage drop at 350 mA	<3,5 V max.
Off state current	<0,2 mA max.
Max. operating voltage	36 V

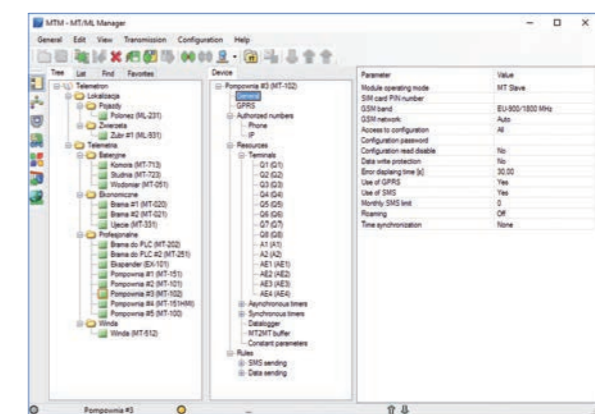
Analog inputs AN1, AN2 (4 – 20 mA)

Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	25 Ω typ.
Voltage drop at 20 mA	<5 V max.
A/D converter	10 bit
Accuracy	±1,5 % max.
Nonlinearity	±1 % max.
Maximum operating voltage	36 V

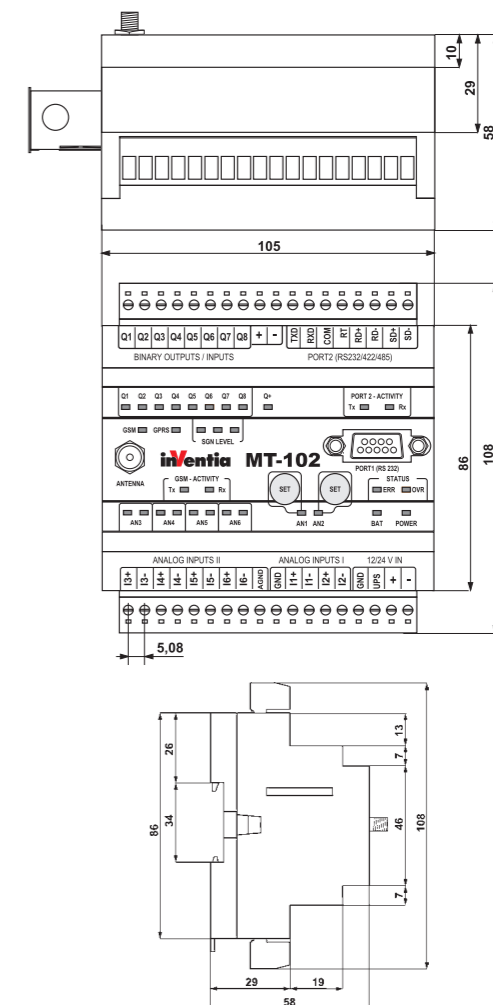
Analog inputs AN3 – AN6 (4 – 20 mA)

Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	50 Ω typ.
Voltage drop at 20mA	5,5 V max.
A/D converter	U/f
Accuracy	±0,5 % max.
Nonlinearity	±0,2 % max.
Maximum operating voltage	36 V

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



0-8DI / 0-8DO

6AI



DIN RAIL

RS-232

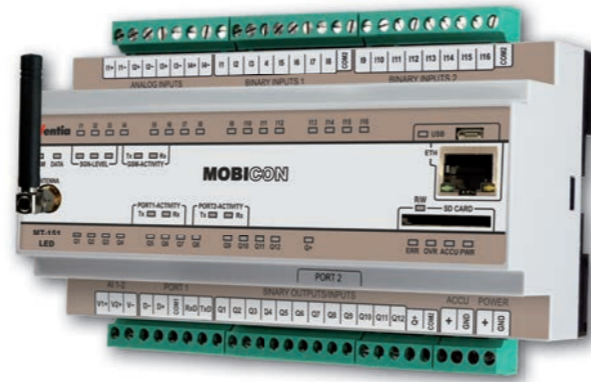
RS-232/422/485

MT-102

MT-102

MT-151 LED v2 – Mobile Controller for 2G/3G telemetry

- 2G/3G data packet transmission
- Embedded GSM 2G/3G modem
- Dual-SIM technology (passive) – access to 2 independent GSM networks ensures superior availability
- 16 binary inputs (galvanic isolation)
- 12 binary outputs, selectively configurable as inputs (galvanic isolation)
- 4 analog inputs 4–20 mA (galvanic isolation)
- 2 analog inputs 0–10 V (w/o galvanic isolation)
- Ethernet port 10Base-T/100Base-TX
- RS-232/485 serial port for external devices (galvanic isolation)
- RS-232 port with 5 V feeding for operator panels
- 48 diagnostic LEDs
- Battery buffered power supply (SLA battery support)
- Data logger with 0,1 sec resolution (SD card support)
- Programmable logic controller (PLC)
- Real Time Clock (RTC)
- Standard communication protocols (MODBUS RTU, MODBUS TCP, M-BUS, SNMP, IEC 60870-5-104)
- FlexSerial – programmable handling of non-standard serial protocols
- Remote configuration, programming, diagnostics and firmware upgrade (OTA)



- Configurable alarm levels, hysteresis, deadband and filtration for analog inputs
- Data and event recording on SD card with 0,1 sec res.
- Transmission of data from external devices connected to RS-232/485 serial port
- 5 V feeding provided for external device connected to RS-232 serial port (e.g. operator panel, GPS receiver)
- Configurable events based on mirrored resources of external devices
- Remote configuration and programming via GPRS/HSPA
- SNMP, M-Bus, FlexSerial, IEC 60870-5-104 support
- Configurable access security – list of authorized IPs and tel. numbers, optional password
- DIN rail mounting
- Supply voltage 12/24 VDC (24 VDC in case of using connected external battery)
- Built-in management of external SLA backup battery
- Built-in advanced auto-diagnostics
- Detachable terminal blocks

General

Dimensions (L x W x H)	157 x 86 x 58 mm
Weight	382 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 do +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40

GSM/GPRS Modem

Modem type	Cinterion EHS6
GSM	850, 900, 1800, 1900
UMTS	800, 850, 900, 1900, 2100
Antenna	50 Ω

Inputs I1 – I16 *

Input voltage range	0 – 30 V
Input resistance	2,4 mA
Input voltage ON (1)	> 9,4 V
Input voltage OFF (0)	< 8,4 V

Inputs Q1 – Q12 *

Input voltage range	30 V
Input resistance	2,4 mA
Input voltage ON (1)	> 9,4 V
Input voltage OFF (0)	< 8,4 V

Outputs Q1 – Q12

Maximum output current	100 mA
Voltage drop @ 100 mA	< 0,5 V max.
OFF state current	< 100 μA

Analog inputs 0 – 10 V (2)

Input voltage range	0 – 10 V
Maximum input voltage	20 V
Input impedance	197 kΩ typ.
A/D converter resolution	12 bit
Accuracy (@ 25°C)	0,5 %

* according to IEC 61131-2 for switch type 1 and 3

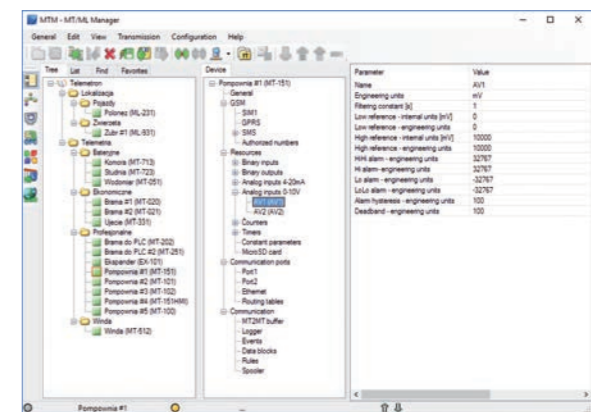
Analog inputs 4 – 20 mA (4)

Input current range	4 – 20 mA
Maximum input current	50 mA
Dynamic input impedance	55 Ω typ.
Voltage drop @ 20 mA	< 5 V
A/D converter resolution	14 bit
Accuracy (@ 25 °C)	0,2 %

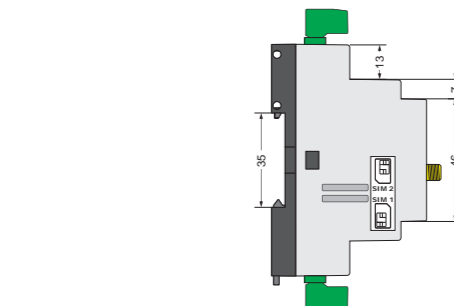
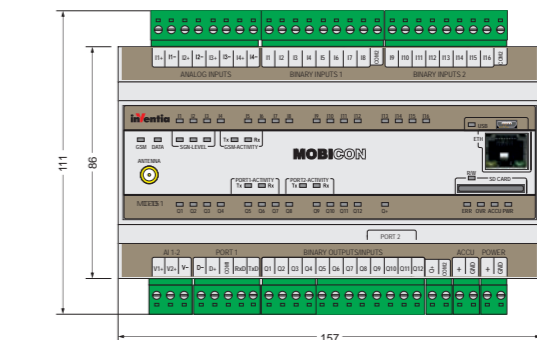
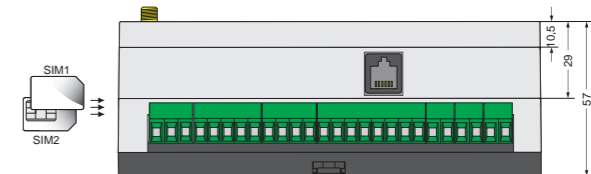
Power supply

DC (nom. 12/24 V)	10,8 – 30 V		
Input current (@ 24 VDC)	Idle	Active	Max.
	0,06 A	0,25 A	1,00 A

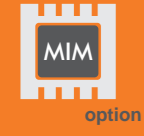
Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-151 LED v2



16-28DI /12DO

6AI



RS-232

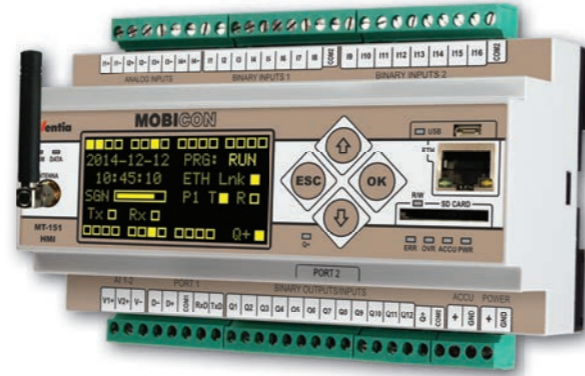
RS-232/485

3G option



MT-151 HMI v2 – Mobile Controller for 2G/3G telemetry

- 2G/3G data packet transmission
- Embedded GSM 2G/3G modem
- Dual-SIM technology (passive) – access to 2 independent GSM networks ensures superior availability
- 16 binary inputs (galvanic isolation)
- 12 binary outputs, selectively configurable as inputs (galvanic isolation)
- 4 analog inputs 4 – 20 mA (galvanic isolation)
- 2 analog inputs 0 – 10 V (w/o galvanic isolation)
- Ethernet port 10Base-T/100Base-TX
- RS-232/485 serial port for external devices (galvanic isolation)
- RS-232 port with 5 V feeding for operator panels
- OLED graphic display (128x64 pixels)
- Diagnostic LEDs
- Battery buffered power supply (SLA battery support)
- Data logger with 0,1 sec resolution (micro SD card support)
- Programmable logic controller (PLC)
- Standard communication protocols (MODBUS RTU, MODBUS TCP, M-BUS, SNMP, IEC 60870-5-104)
- FlexSerial – programmable handling of non-standard serial protocols
- Remote configuration, programming, diagnostics and firmware upgrade via GPRS



- 5 V feeding provided for external device connected to RS-232 serial port (e.g. operator panel, GPS receiver)
- Configurable events based on mirrored resources of external devices
- Remote configuration and programming via GPRS/HSPA of external devices
- Configurable access security – list of authorized IPs and tel. numbers, optional password
- DIN rail mounting
- Supply voltage 12/24 VDC (24 VDC in case of using connected external battery)
- Built-in management of external SLA backup battery
- Built-in advanced auto-diagnostics
- Detachable terminal blocks

General

Dimensions (L x W x H)	157 x 86 x 58 mm
Weight	382 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 do +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40

GSM/GPRS Modem

Modem type	Cinterion EHS6
GSM	850, 900, 1800, 1900
UMTS	800, 850, 900, 1900, 2100
Antenna	50 Ω

Inputs I1 – I16 *

Input voltage range	0 – 30 V
Input resistance	2,4 mA
Input voltage ON (1)	> 9,4 V
Input voltage OFF (0)	< 8,4 V

Inputs Q1 – Q12 *

Input voltage range	30 V
Input resistance	2,4 mA
Input voltage ON (1)	> 9,4 V
Input voltage OFF (0)	< 8,4 V

Outputs Q1 – Q12

Maximum output current	100 mA
Voltage drop @ 100 mA	< 0,5 V max.
OFF state current	< 100 μA

Analog inputs 0 – 10 V (2)

Input voltage range	0 – 10 V
Maximum input voltage	20 V
Input impedance	197 kΩ typ.
A/D converter resolution	12 bit
Accuracy (@ 25°C)	0,5 %

* according to IEC 61131-2 for switch type 1 and 3

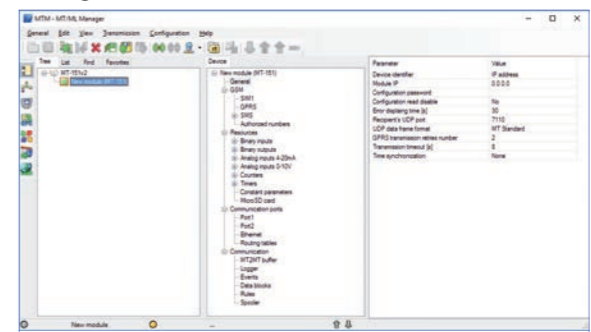
Analog inputs 4 – 20 mA (4)

Input current range	4 – 20 mA
Maximum input current	50 mA
Dynamic input impedance	55 Ω typ.
Voltage drop @ 20 mA	< 5 V
A/D converter resolution	14 bit
Accuracy (@ 25 °C)	0,2 %

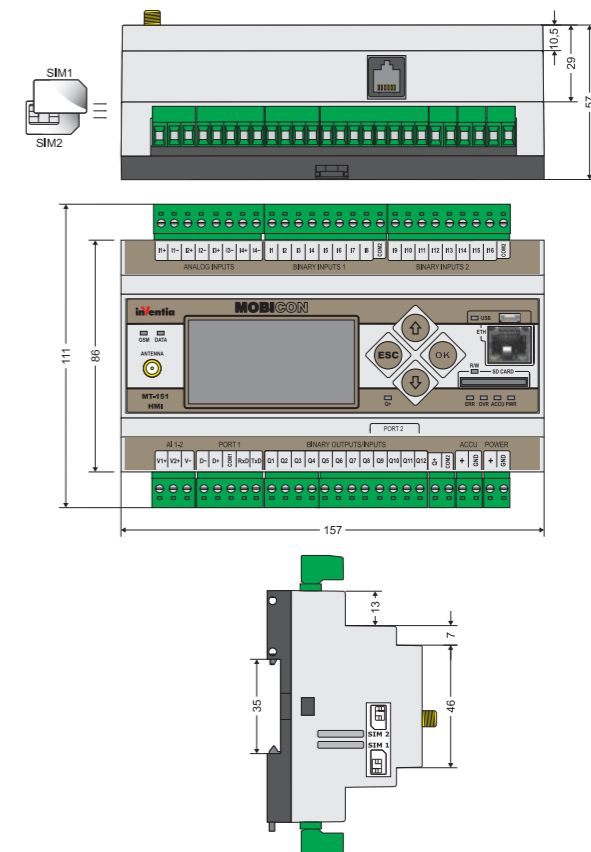
Power supply

DC (nom. 12/24 V)	10,8 – 30 V		
Input current (@ 24 VDC)	Idle 0,06 A	Active 0,25 A	Max. 1,00 A

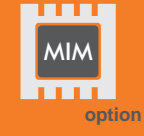
Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-151 HMI v2



16-28DI /12DO

6AI



DIN RAIL

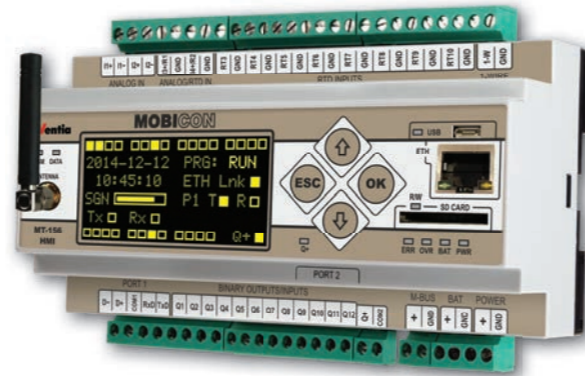
RS-232

RS-232/485

3G option



- 2G/3G data packet transmission
- Embedded GSM 2G/3G modem
- Dual-SIM technology (passive) – access to 2 independent GSM networks ensures superior availability
- **10 inputs for PT1000 (2 of the can be configured as 4-20mA inputs)**
- 2 analog inputs 4-20 mA (galvanic isolation)
- 12 binary outputs, selectively configurable as inputs (galvanic isolation)
- 1-wire input
- Ethernet port 10Base-T/100Base-TX
- RS-232/485 serial port for external devices (galvanic isolation)
- **M-BUS interface (support up to 16 slave units)**
- **Dedicated RS-232 serial port for communication with the IOT-RG-01 data module**
- OLED graphic display (128x64)
- Diagnostic LEDs
- Battery buffered power supply (SLA battery support)
- Real-Time Clock (RTC)
- Programmable logic controller PLC
- Data logger with 1 sec resolution (SD card support)
- Standard communication protocols (MODBUS RTU, GAZMODEM, M-BUS, NMEA 0183)
- Remote configuration, programming, diagnostic and firmware update over 2G/3G network
- 3-years warranty



- Transmission of data from external devices connected to RS-232/485 serial port and Ethernet port
- Configurable events based on mirrored resources of external devices
- Remote configuration and programming via GPRS\EDGE\3G and Ethernet port
- Configurable access security – list of authorized IPs and tel. numbers, optional password
- DIN rail mounting
- Supply voltage 12/24 VDC (24 VDC required for battery buffered power supply operation)
- Built-in management of external SLA backup battery
- Built-in advanced auto-diagnostics
- Detachable terminal blocks
- Auto configuration based on individual ID number read through 1-Wire interface

General

Dimensions (L x W x H)	157 x 86 x 58 mm
Weight	382 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 do +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40

GSM/GPRS Modem

Modem type	Cinterion EHS6
GSM	850, 900, 1800, 1900
UMTS	800, 850, 900, 1900, 2100
Antenna	50 Ω

Inputs Q1 – Q12

Maximum input voltage	36 V
Input current	5,4 kΩ typ.
Input voltage ON (1)	> 9,4 V
Input voltage OFF (0)	< 8,4 V

Outputs Q1 – Q12

Maximum output current	100 mA
Voltage drop @ 100 mA	< 0,5 V
OFF state current	< 10 μA

Power Supply

DC (nom. 12/24 V)	10,8 – 30 V		
Input current (@ 24 VDC)	Idle	Active	Max.
	0,06 A	0,25 A	1,00 A

Analog inputs 4-20mA/PT-1000 (2)

Measurement range	4-20 mA/-50 to +150 °C
Input impedance	47 Ω
A/D converter resolution	20 bit
Accuracy (@ 25°)	0,2 % / ±0,5 °C

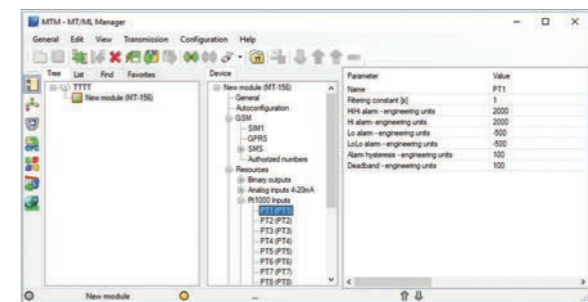
Analog inputs 4 – 20 mA (2)

Input current range	4 – 20 mA
Maximum input current	50 mA
Dynamic input impedance	55 Ω typ.
Voltage drop @ 20 mA	< 5 V
A/D converter resolution	14 bit
Accuracy (@ 25 °C)	0,2 %

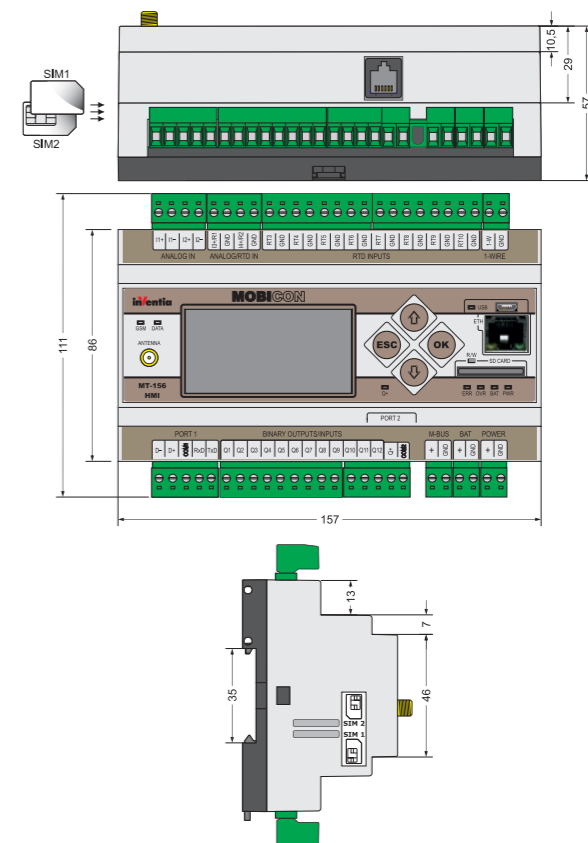
Analog inputs PT1000 (10)

Measurement range	-50 do +150 °C
Connection type	2-wire
A/D converter resolution	20 bit
Accuracy (@ 25°)	±0,5 °C

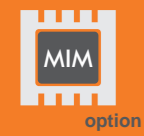
Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-156 HMI



12DI /12DO

4AI

10RTD



DIN RAIL

RS-232/485

3G



M-BUS

MT-202 – Wireless to serial communication gateway GPRS – Modbus

- GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem with automatic login onto GPRS network
- Isolated serial communication port for external devices (RS-232/422/485)
- Programmable functions for data processing
- Standard communication protocols (MODBUS RTU/ASCII, M-BUS, NMEA 0183)
- Built-in Master and Slave functionality
- FlexSerial mode for program based protocol handling
- Data mirror of external resources and event triggered transmission (unsolicited messaging)



MT-202 module has been designed for easy, wireless integration via GPRS network of various remote intelligent devices (e.g. PLC controllers, I/O stations, measuring devices, operator panels) equipped with serial port RS-232/422/485.

MT-202 can be used as wireless, "transparent" serial port, but it can also play a role of a local Master querying periodically an external device for user defined resources (e.g. inputs, outputs, analog inputs, internal registers and flags). In such case MT-202 creates in memory a mirror of the external resources and detects alarms, state changes, analog value changes and fulfilled logic conditions incorporating raw and calculated values. Data are transmitted via GPRS according to user defined rules.

Industrial grade design, integral GSM/GPRS modem, user programming capabilities, attractive technical features and easy to use configuration tools - these are important advantages of MT-202 in applications of wireless telemetry, maintenance, diagnostic, control and automated meter reading (AMR).

Resources

- Isolated serial port RS-232/485/422
- User program accessible internal flags and registers:
 - 8192 internal 16-bit registers
 - 176 internal flags in binary output space
 - 256 internal retentive flags
 - 256 internal non-retentive flags
 - 12 independent internal timers
 - 32 special purpose flags for triggering alarm and event messages
- Firmware Flash memory with remote update capability
- Real Time Clock (RTC) with external synchronization functions
- Power backup detection input

Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
 - CSD - circuit switched data transmission (in modem mode only)
- Access to internal resources with standard MODBUS RTU protocol
- Intelligent packet routing and Multimaster operation in MODBUS mode
- Packet routing in transparent mode
- Wireless serial port capability in transparent mode
- Event triggered GPRS transmission (unsolicited messaging)
- Programmable logic functions using markers, timers, counters, diagnostic flags and registers for event triggering (data transmission, SMS and e-mail sending, setting values of markers and internal registers)
- Unsolicited messages triggered by change of marker state or fulfilled logic condition
- Time-based and event-based SMS messages
- Automatic update of dynamic fields in SMS message
- Functionality of local Master for slave devices connected to the serial communication port RS-232/422/485
- External resources mapping (mirroring) for event detection and triggering
- Programmable handling of non-standard communication protocols - FlexSerial mode
- MT2MT buffer for direct data sharing between MT-202, MT-101 and MT-102 telemetry modules.
- Built-in data integrity and frame delivery checking
- "Watchdog" circuitry - automatic reset in case of abnormal state
- Timers synchronized with RTC
- Local and remote (via GPRS) configuration, programming and firmware update
- Configurable security settings - list of authorized IP addresses and telephone numbers, access passwords
- DIN rail mounting
- Power supply 12/24V DC, 24 V AC
- Removable terminal blocks
- Diagnostic LEDs (module status, GSM transmission activity, GSM signal level, GPRS activity, serial communication activity)
- User-friendly configuration tools

General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting	DIN Rail 35mm
Operating temperature	-20 to +65 °C
Protection class	IP40
Max. voltage at all connectors relative to device's GND.	60 Vrms max.

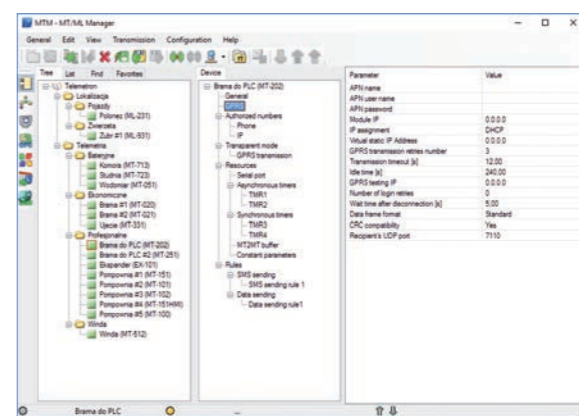
Power supply

Voltage range (DC 12, 24V)	10,8 – 36 V
AC (24V)	18 – 26,4 Vrms
Input current (A) (for 12V DC)	Idle 0,10 Active 0,60 Max 1,90
Input current (A) (for 24V DC)	Idle 0,06 Active 0,25 Max 1,00

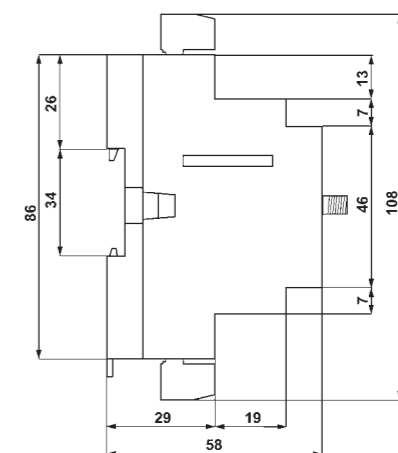
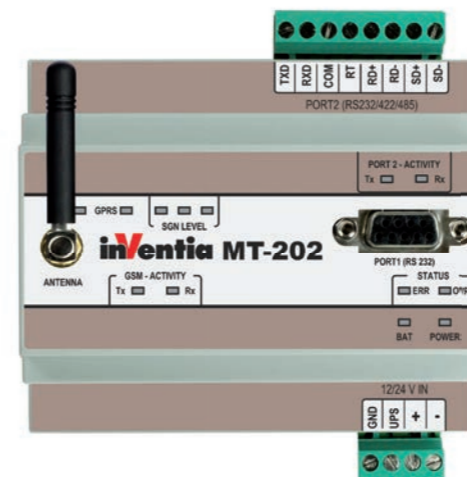
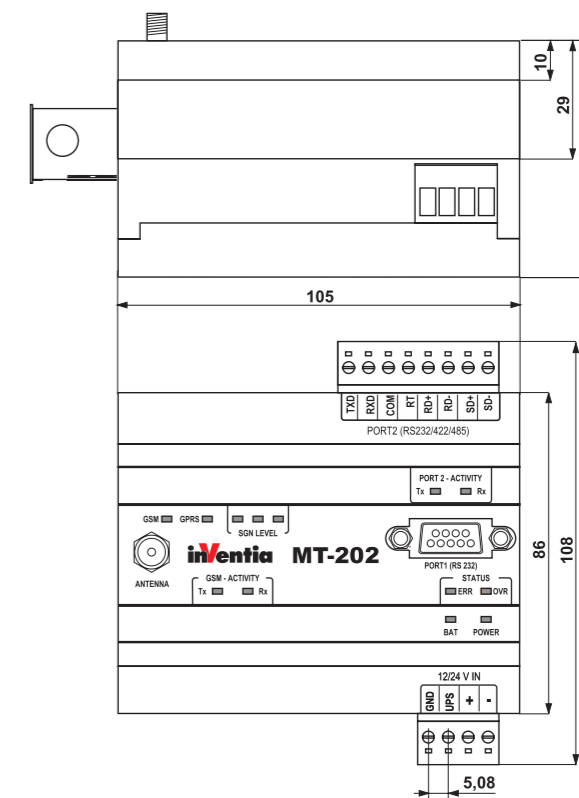
GSM/GPRS Modem

Modem type	CINTERION TC63i
GSM	QuadBand (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824 – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880 – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710 – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 1930 – 1990 MHz
Sender's peak power GSM850/EGSM900	33 dBm (2W) - class 4 station
Sender's peak power DCS1800/PCS1900	30 dBm (1W) - class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50 Ω

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-202

MT-202

MT-251 – GPRS/3G gateway with Ethernet port

- GSM/GPRS/EDGE and UMTS/HSDPA packet transmission
- Integral modem with 6-band UMTS (800/850/900/1700/1900/2100) and quad-band GPRS/EDGE (850/900/1800/1800)
- 2 binary inputs, 1 SSR NO output
- Ethernet port 10Base-T/100Base-TX
- 2 serial port to communicate with external devices (expanders): RS-232 with RTS/CTS handshaking, RS-485
- Built-in isolated power supply unit
- Programmable logic controller (PLC)
- Data logger with 0,1 sec resolution (microSD card support)
- Protocol converter (supports Modbus RTU, Modbus TCP, UDP)
- Built-in Master and Slave functionality
- Smart routing of packets
- SNMP ver. 1 protocol support (included traps and polling functionality)
- Diagnostic LEDs (module status, GSM transmission activity, GSM signal level, 2G/3G activity, serial and Ethernet communication activity)
- "Watchdog" circuitry – automatic reset in case of abnormal state
- Option of soldered MIM card replaced SIM



- Built-in event processor for data rules transmission and SMS messages sending
- Remote configuration, programming, diagnostics and firmware upgrade via 2G/3G network
- Battery buffered power supply (SLA battery support)
- Power supply 18 – 55 VDC
- Real Time Clock (RTC)
- Industrial design, DIN rail mounting, spring terminal blocks

- Firmware Flash memory with remote update capability
- Data logger supporting microSD card
- Option of soldered MIM card replaced SIM
- RTC with external synchronization functions

Functionality

- Transmission mode: 2G/3G packet transmission, SMS, Ethernet
- Access to remote resources using standard protocols MODBUS RTU and MODBUS TCP
- Intelligent packet routing and Multimaster support in MODBUS mode
- Transmission of data from external devices connected to serial and Ethernet port
- External resources mapping (mirroring) for event detection and triggering
- MT2MT buffer for direct data sharing between other MT telemetry modules
- Multibroadcast for transparent mode
- SNMP ver. 1 protocol support (included traps and polling functionality). Module operates as a SNMP agent – device which can be polled by server and can send unsolicited information (traps) to server. External resources mapping (mirroring) for event detection and triggering
- Data logger recording on microSD card with 0,1 s resolution
- Programmable control logic using I/Os, timers, counters, flags and register for triggering events (data transmission/recording, SMS transmission, e-mail transmission, setting output and internal register, etc.)
- Configurable SMS messages triggered by alarms and scheduled
- Dynamic Fields in SMS text, support for symbolic names and macros

MT-251 module has been designed for wireless integration over 2G/3G network of various remote devices (e.g. measuring units, PLC controllers, I/O stations, operator panels) equipped with serial port RS-232, RS-485 or Ethernet port. With compact, robust design, attractive technical features and easy to use configuration tools the MT-251 gateway is an optimal solution for demanding wireless telemetry, control, diagnostic, surveillance and alarm systems. Module is equipped with 3G modem and optionally can be produced with MIM (Machine Identification Module) soldered to PCB replacing or backing-up standard SIM card. It can be powered from DC voltage source (18 – 55 VDC) and additionally it is equipped with intelligent charger designed to manage of external SLA backup battery.

MT-251 can be used as wireless, "transparent" serial and Ethernet port, but it can also play a role of local Master querying periodically an external device for user defined resources. In such case MT-251 creates in memory a mirror of the external resources and detects alarms, state changes and fulfilled logic conditions incorporating raw and calculated values. Data are transmitted via 2G/3G network according to user defined rules. Data may be logged with precise timestamp in non volatile Flash memory according to configured schedule or on event.

Resources:

- 2 binary inputs, 1 SSR NO output
- Ethernet port 10Base-T/100Base-TX
- RS-232 serial port with RTS/CTS handshaking
- RS-485 serial port
- USB port for local configuration and programming
- Interface for backup 12V SLA battery – charging support
- Internal flags and registers for user application program

- Event based transmission (unsolicited messaging) triggered by change of binary input/output state, internal flag state, by true condition.
- Remote configuration and programming via 2G/3G network
- Configurable access security – list of authorized IPs and telephone numbers, optional password
- DIN rail mounting
- 18-55 VDC Power supply
- Built-in management of external SLA backup battery
- Built-in advanced auto-diagnostics
- Spring terminal blocks
- User friendly configuration tools and communication driver (OPC and RDB support)

General

Dimensions (L x W x H)	105x86x58 mm
Weight	200 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 to +60 °C
Protection class	IP40
Humidity	up to 95 % non condensing

GSM/GPRS Modem

Modem type	uBlox LISA-U201
GSM/GPRS/EDGE	850/900/1800/1900
UMTS/HSPA	800/850/900/1900/2100
Peak transmitting power (GSM 850/EGSM 900)	33 dBm (2W) – class 4 station
Peak transmitting power (DCS 1800/PCS 1900 MHz)	30 dBm (1W) – class 1 station
Peak transmitting power (WCDMA/HSDPA/HSUPA)	24 dBm – class 3 station
GPRS class	10
Modulation	0,3 GMSK
Channel spacing	200 kHz
2G frequency range:	
GSM 850	Transmitter: 824 MHz - 849 MHz Receiver: 869 MHz - 894 MHz
EGSM 900	Transmitter: 880 MHz - 915 MHz Receiver: 925 MHz - 960 MHz
DCS1800	Transmitter: 1710 MHz - 1785 MHz Receiver: 1805 MHz - 1880 MHz
PCS 1900	Transmitter: 1850 MHz - 1910 MHz Receiver: 1930 MHz - 1990 MHz
3G frequency range	2100 MHz, 1900 MHz, 1700 MHz, 850 MHz, 800 MHz, 900 MHz
3G data rate	HSUPA category 6, up to 5,76Mb/s UL HSDPA category 8, up to 7,2Mb/s DL LISA-U200 WCDMA PS data up to 384 kb/s DL/UL
Antenna	50 Ω

Power Supply

Direct Current DC	18 – 55 V		
Input current for 24 VDC	Idle 0,09	Active 0,25	Max 1,00
External battery nominal voltage	6 V		
External battery nominal capacity	12 Ah		
Maximum external battery charging current	100 mA		

Ethernet Port

Standard	10Base-T, 100Base-TX
Connector type	RJ45, M12 as option
Number of M12 pins	4 pin
M12 Coding	„D”

Binary Inputs I1, I2

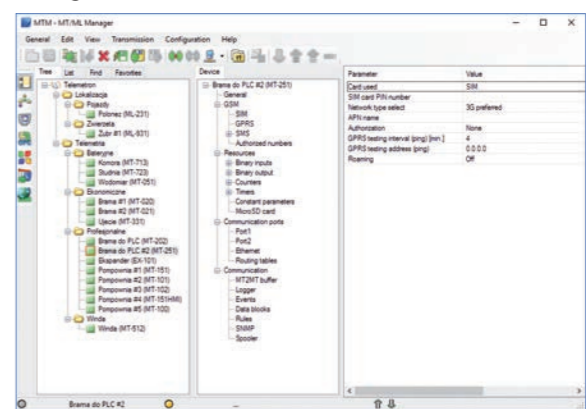
Operating in binary input mode:

Maximum input voltage	55 V
Input resistance	11,2 kΩ typ.
Input voltage for high state (1)	> 9 V min.
Input voltage for low state (0)	< 3 V max.

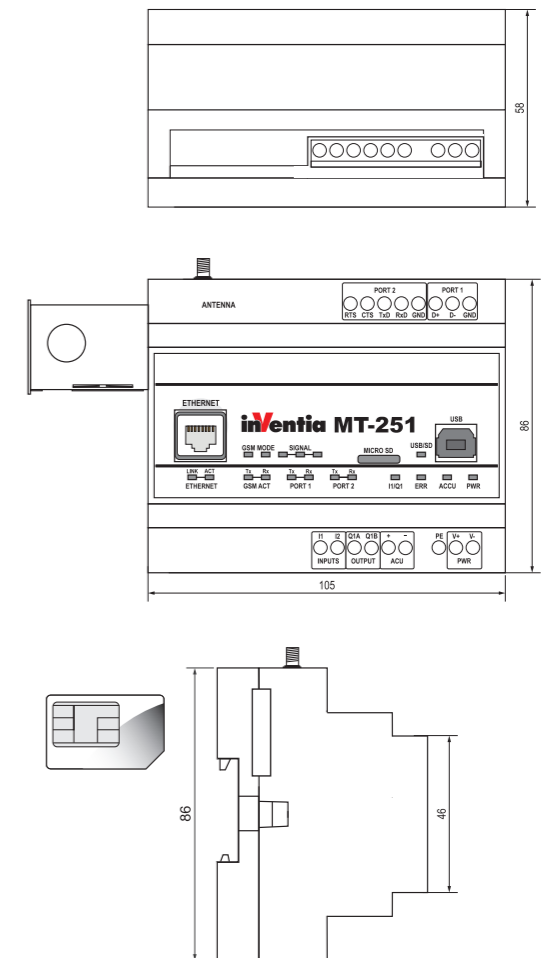
Binary output Q1:

Recommended mean current for output	100 mA
Maximum current for output	1 A max.
Output resistance in ON state	500 mΩ max.

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-251

WARRANTY
3
YEARS



0-1DI
/0-1DO



DIN RAIL

RS-232

RS-485

3G



ML-231 – GPS/GPRS tracking module

- Specialized module for vehicle tracking and monitoring
- Integral, 50 channels GPS module with highest sensitivity (-162 dBm) in SuperSense® technology
- Integral, 4-band, GSM modem
- Binary inputs and outputs
- Efficient fuel measuring
- Driver identification
- Large data recorder 30k records
- 2 serial ports (one RS485*)
- 3 axis accelerometer
- Audio input and output*

* option



General

Dimensions (length x width x height)	112 x 65 x 23,5 mm
Weight	110 g
Mounting mode	Velcro/Strap
Operating temperature	-20 to +55 °C
Protection class	IP40

GSM/GPRS Modem

Modem type	µblox LEON G100
GSM	Quad band (850/900/1800/1900)
GPRS class	10
Antenna	50 Ω SMA socket

GPS Receiver

Receiver type	µblox NEO-6
Sensitivity	-162 dBm Super Sense® Indoor GPS
Channel number	50
Antenna	Active 3V MCX connector

Power supply

DC voltage	9 – 30 V		
Input current (mA) (for 13,8 V)	Max 200	Idle 35	Power Save <10
Input current (mA) (for 27 V)	Max 100	Idle 20	Power Save <10

Inputs I1 – I5

Input voltage range	0 – 30 VDC		
Input resistance	22 kΩ		
Input voltage ON (1)	> 7 V		
Input voltage OFF (0)	< 2,5 V		
Frequency range in counter mode (I3, I4)	50 Hz		
Minimum pulse width "1"	20 ms		

Output 1, 2

Recommended average current for single output	250 mA
Voltage drop at 250 mA	0,3 V
OFF current	20 µA
Application	Immobilizer, parking mode, LED/BUZZER signalling, others

Input 1-Wire 1, 2

Standard	Dallas I-Button
Application	driver authorization temperature measurement

Analogue Inputs

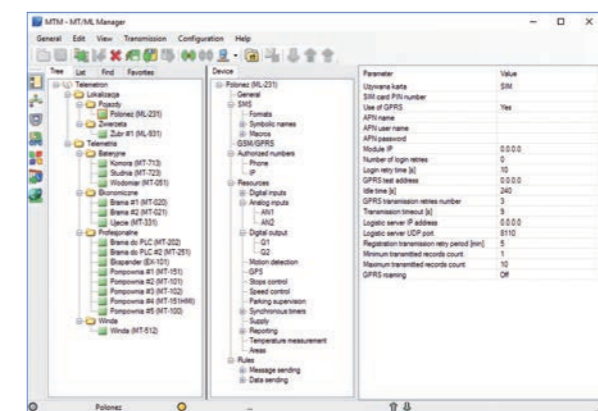
Measurement range	0 – 10 V*
Input Resistance	200 kΩ
A / D converter	12 bits

* with the possibility to increase the scope

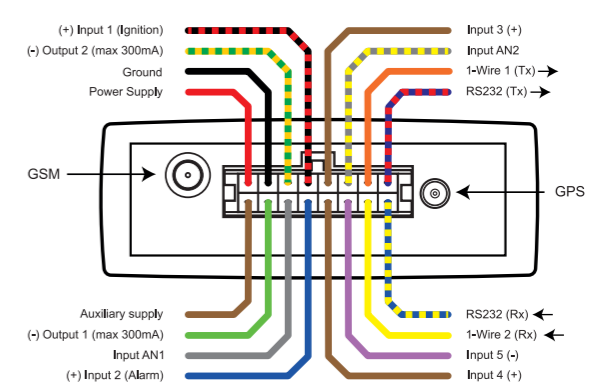
Serial ports

Standard	RS-TTL (3 V)
Optional	RS-485
Application	External expansion modules (CAN, RFID)

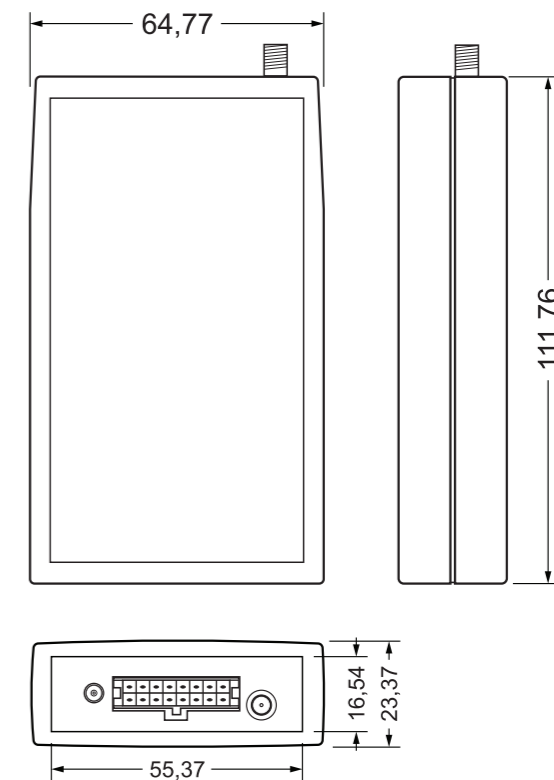
Configuration environment



Connections



Drawings and dimensions (all dimensions in millimeters)



ML-231 is a specialized telemetry module dedicated to monitor status and location of vehicles. Module's design is based on latest GPS/GSM technologies securing precision of location and GSM signal propagation. The design complies with automotive industry design standards.

Resources

- 5 binary inputs including:
 - dedicated ignition ON detection
 - dedicated alarm detection input
 - 2 general purpose binary inputs (with counting and scaling function)
 - 1 ground sensitive binary input
- 2 binary outputs
- 2 voltage analogue inputs
 - frequency measurement
 - average value computing
 - max value detection
 - differential measurement
 - voltage measuring with alarm thresholds
 - precise fuel level measuring
- Main supply input with voltage monitoring
- Auxiliary supply with voltage monitoring
- 2 1-Wire inputs (Dallas iButton) for driver identification and temperature measuring
- Audio input & output (for loudspeaker and microphone)*

Functionality

- Cyclical position calculation on GPS signal base
- Monitoring of analogue and binary inputs and outputs
- Monitoring of fuel level and rapid level falls
- Speed monitoring/speeding/stopping

- Binary inputs signal filtration eliminates signal interference
- Additive or subtractive pulse counting on I3 and I4 inputs allows variable flow meter connections.
- Controlling binary outputs according to internal logic and remote commands
- Detection of missing GPS signal
- Reporting according to defined distance and time criteria as well as driving direction change
- Transmission of information as a result of triggering predefined event
- Logging of data in case of missing GSM communication
- Transmission modes
 - GPRS – packet transmission
 - SMS
 - e-mail
- Configurable transmission in home network and in roaming
- Dynamic SMS composing allowing transmission of current measurements values
- Configurable SMS limits
- Local or remote configuration via GPRS
- Configurable access permissions – list of authorized IP addresses and phone numbers
- Monitoring of main and auxiliary supply voltage
- Diagnostic LED facilitating module's start
- Detachable connector and antenna sockets
- Dedicated local connection socket for PC for configuration and verification of parameters.
- 3-axis acceleration measurement
 - motion detection
 - collision detection (with 60 seconds log*)

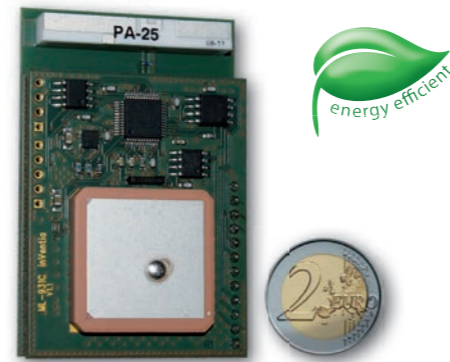
* option



ML-931 – Energy saving location module GPS/GPRS

- Specialized module for location and monitoring of wild and free going animals
- Integral, 50 channels GPS receiver with highest sensitivity (-162 dBm) SuperSense® technology
- Integral, quad-band GSM modem
- 1 binary/supply* output
- Large 30k records data logger
- RS232serial port (TTL)*
- 3 axis accelerometer

* option



Energy saving location module ML-931 is a specialized telemetry module dedicated to monitor wild animals and other mobile objects.

Module's design is based on latest GPS/GSM technologies securing precise location and reliable operation in changing GSM propagation conditions.

The module is manufactured as OEM without dedicated housing.

Resources

- 1 binary/supply output
- Main supply input with voltage monitoring
- Real Time Clock
- 30k records logger with option of expanding to 60k

Functionality

- Cyclical location computing based on received GPS signals
- Detection of missing GPS signal
- Reporting according to defined criteria of time, motion, activity
- Logging of information when GSM communication is not available

- Transmission modes
 - GPRS – packet transmission
 - SMS
- Transmitting information according to time schedule
- Configurable home and roaming transmission parameters
- Dynamic SMS compilation allowing sending current measurement data
- Adjustable SMS transmission limit
- Remote configuration via GPRS/SMS - the module is preconfigured by manufacturer
- Configurable access security list for IP addresses and phone numbers
- Monitoring of power supply voltage
- Monitoring of internal parameters state
- 3-axis accelerometer
 - motion detection
 - activity detection
- Optional silicone rubber molding to achieve IP65 ingress protection
- Reed-switch activated storage mode
- LED module's status indicator
- RS232 serial port for communication with extension modules*

* option



General

Dimensions (length x width x height)	62 x 40 x 16 mm
Weight	40 g
Gross weight (with silicone)	100 g
Mounting method (proprietary)	user defined
Operating temperature	-20 to +55 °C
Protection class	none (IP65 optional)

GSM/GPRS Modem

Modem type	µblox LEON G100
GSM	GSM Quad Band (850/900/1800/1900)
GPRS class	10
Antenna	built in antenna

GPS receiver

Receiver type	µblox NEO-7
Sensitivity	-162 dBm Super Sense® Indoor GPS
Channel number	50
Antenna	built in passive antenna

Power supply

DC voltage	2 – 5 V
Current in active state (mA)	50 mA (average) 400 mA (max.)
Current in sleep state (µA)	< 50 µA (activity control off) < 200 µA (activity control on)

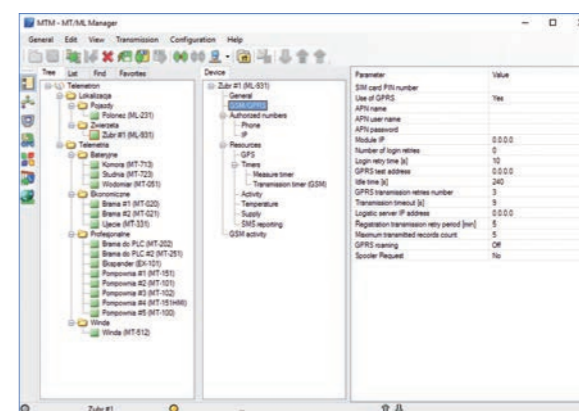
Binary output/power supply

Maximum current	50 mA
Logic level "0"	0,0 – 0,3 V
Logic level "1"	3,5 – 3,8 V
Application	external power supply (VHF)

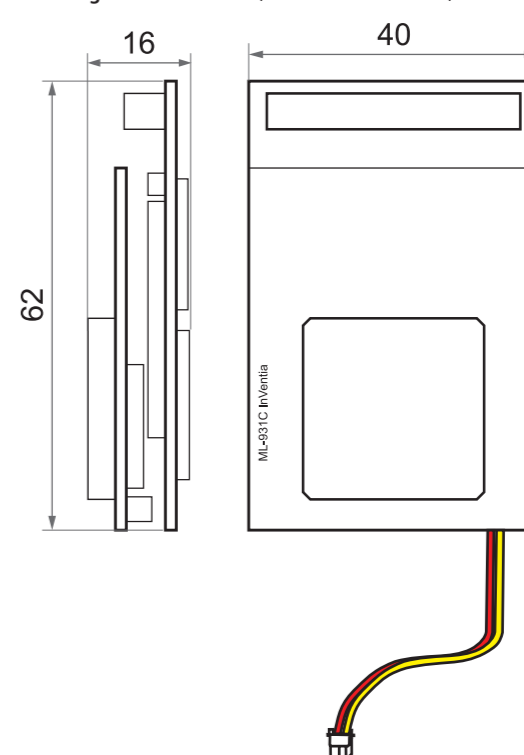
Serial ports

Standard	RS-TTL (2,7 V)
Application	external sensors

Configuration environment



Drawings and dimensions (all dimensions in millimeters)

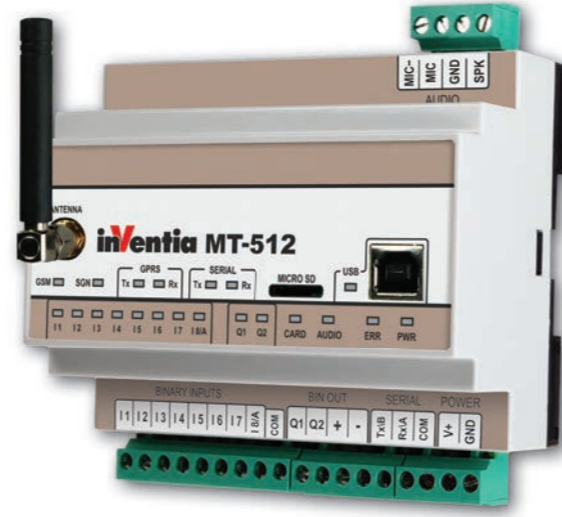


ML-931

ML-931

MT-512 – Specialized Alarm Module for lifts

- GSM/GPRS packet transmission
- Integral GSM 850/900/1800/1900 modem
- Autonomous login into GSM/GPRS network
- 8 opto-isolated binary/counter inputs
- 2 opto-isolated binary outputs
- AUDIO output for standard Intercom
- Capability of replaying recorded voice announcements
- Automatic alarm transmission upon activation of ALARM input (SMS/GPRS)
- Automatic reception of incoming voice calls, call back function
- Automatic confirmation of performed voice connections
- Optional communication port for monitoring and diagnostics of peripheral equipment (RS-232, RS-485)
- Support for MicroSD memory card
- Detachable terminals



General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting	DIN Rail 35 mm
Operating temperature	-20 to +55 °C
Protection class	IP40

GSM/GPRS Modem

Modem type	SIERRA WIRELESS
GSM	QuadBand (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824MHz – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880MHz – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710MHz – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 1930 – 1990 MHz
Sender's peak power GSM850/EGSM900	33 dBm (2W) - class 4 station
Sender's peak power DCS1800/PCS1900	30 dBm (1W) - class 1 station
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50 Ω

Power supply

DC (12V, 24V)	9 – 30 V	
Input current (A) (for 12V DC, battery charged)	Idle 0,06	Max 0,50

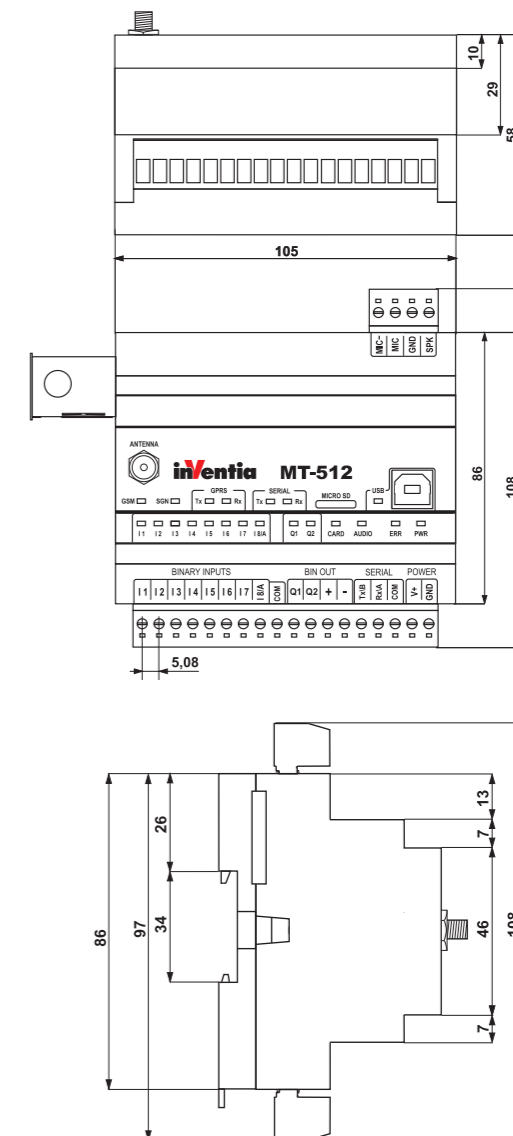
Inputs I1 – ALARM/I8

Input voltage range	-30 – 30 V
Input resistance	5,4 kΩ
Input voltage ON (1)	> 9 V or < -9 V
Input voltage OFF (0)	-3 – 3 V

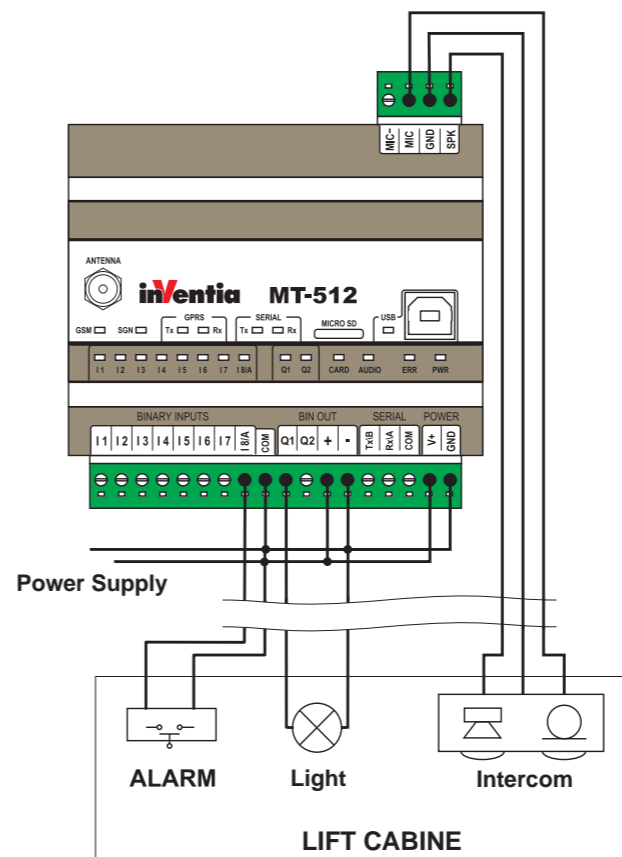
Outputs Q1,Q2

Input voltage range	0 – 30 V
Recommended mean current for single output	50 mA
Single output current	350 mA max.
Average current for all outputs	400 mA max.
Voltage drop for 350 mA	< 3,5 V max.
Current in off state	< 0,2 mA max.

Drawings and dimensions (all dimensions in millimeters)



Application example



Functionality

- Communication methods
 - GPRS – packet transmission
 - SMS
 - AUDIO
- Unsolicited messaging upon ALARM input activation, on state change on binary input or according to a schedule.
- SMS messaging upon ALARM input activation, on state change on binary input or according to a schedule.
- Programmatically set insensitivity time for ALARM input in order to prevent sending multiple alarms on the same event by repetitive activation of ALARM button.
- Programmable filtration constant for binary inputs
- Automatic confirmation of performed voice connection
- Data transmission from/to devices connected to communication port (optional)
- Remote configuration of parameters
- Access control based on authorized IP and phone numbers list with optional password protection
- User friendly configuration tool
- Easy integration with Service Center software
- LED diagnostics (status, GSM activity, GPRS activity, communication port activity, binary inputs and outputs state, active voice connection, MicroSD card errors detected)
- Detachable terminals
- Power supply 9 – 30 V DC
- DIN rail mounting

The MT-512 Specialized Alarm Module for lifts is a dedicated device compliant with the standard EN81-28:2003 "Remote alarm on passenger and goods passenger lifts" harmonized with the Lift Directive 95/16/EC.

The module monitors 8 binary inputs, controls 2 outputs, can establish a voice connection with Service Center and reply recorded messages. Optionally, the module can be equipped with RS-232 or RS-485 communication port for monitoring and diagnostics of peripheral equipment.

Thanks to employed wireless GSM/GPRS transmission the module is an ideal solution for applications where there are no phone landlines or where optimizing of reliability and reducing costs of monitoring systems is desired.

Compact design, integral GSM/GPRS modem, carefully selected technical parameters, interfacing elevator's standard Intercom make MT-512 an optimal choice for new installations as well as an upgrade during maintenance of existing elevators.

Resources

- 1 dedicated, opto-isolated alarm input with adjustable time of insensitivity for repetitive activations
- 7 opto-isolated binary/counter inputs
- 2 opto-isolated controlling outputs
- AUDIO output adapted for standard Intercom
- Optional RS-232 or RS-485 serial port for peripheral equipment (monitoring, diagnostics)
- Flash memory for configuration data, remotely updateable
- Additional external memory (MicroSD card)
- RTC real time clock



8DI/2DO

DIN RAIL

RS-232 option

RS-485 option

MT-512

MT-512

MT-651 – Telemetry module for Cathodic Corrosion Protection Systems

- 6 measurement channels
- Measurement of AC and DC voltages
- Measurement in the range of microvolts
- GSM/GPRS/EDGE and UMTS/HSDPA packet transmission
- Dual-SIM technology
- Additional binary inputs and outputs
- Battery power supply (external power source as optional)
- Built-in GPS receiver with internal antenna and accelerometer
- Internal temperature sensor
- Local communication over USB, RS485 and Bluetooth Low Energy *
- Remote communication via GPRS and SMS
- 3 years warranty



General

Dimensions without connectors (length x width x height)	190 x 75 x 55 mm
Weight	900 g
Operating temperature	-20 to +55 °C
Protection class	IP65

GSM/GPRS Modem GSM/GPRS

Modem type	uBlox Sara-U201*	uBlox Sara-U270
Frequency	2G: 850/900/1800/1900 MHz 3G: 800/850/900/1900/2100 MHz	2G: 900/1800 MHz 3G: 900/2100 MHz
Antenna	50Ω	
GSM antenna connector	SMA-m	

* option

Power supply

Voltage range (DC)	7 – 30 V
Internal battery pack	3 lithium batteries 3xLSH14 (3,6 V) 10,8 V; 17,4 Ah capacity
Input current (for 24V):	
Idle	800 μA
Active	70 mA, 200 mA (charging)
Max	0,7 A

Inputs IN1, IN2

Input voltage range	0 do +30 V
Input resistance	60 kΩ typ.
Input voltage ON (1)	> 9 V min
Input voltage OFF (0)	< 3 V max.
Minimum pulse length	5 ms

Outputs OUT1, OUT2

Voltage switching AC/DC	220 V
Single output current	1.5 A
Maximum switching power	50 W, 100 VA

Two group of optoisolated input with common ground (ANA, ANB)

0-100 mV input: mVA, mVB	
Measurement range	±100 mV
Measurement resolution	1 μV
Accuracy DC	±0,1 %
Input resistance	> 1 MΩ
0-100V input: ANA1, ANA2, ANB1, ANB2	
Measurement range DC	±10 V; ±100 V
Measurement range AC	100 V
Accuracy DC	±0,1 %
Input resistance	> 10 MΩ

Internal temperature sensor

Accuracy	±1 °C
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GPS receiver

Time synchronization accuracy	±1 ms
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Communication interfaces RS-485, USB, BLE

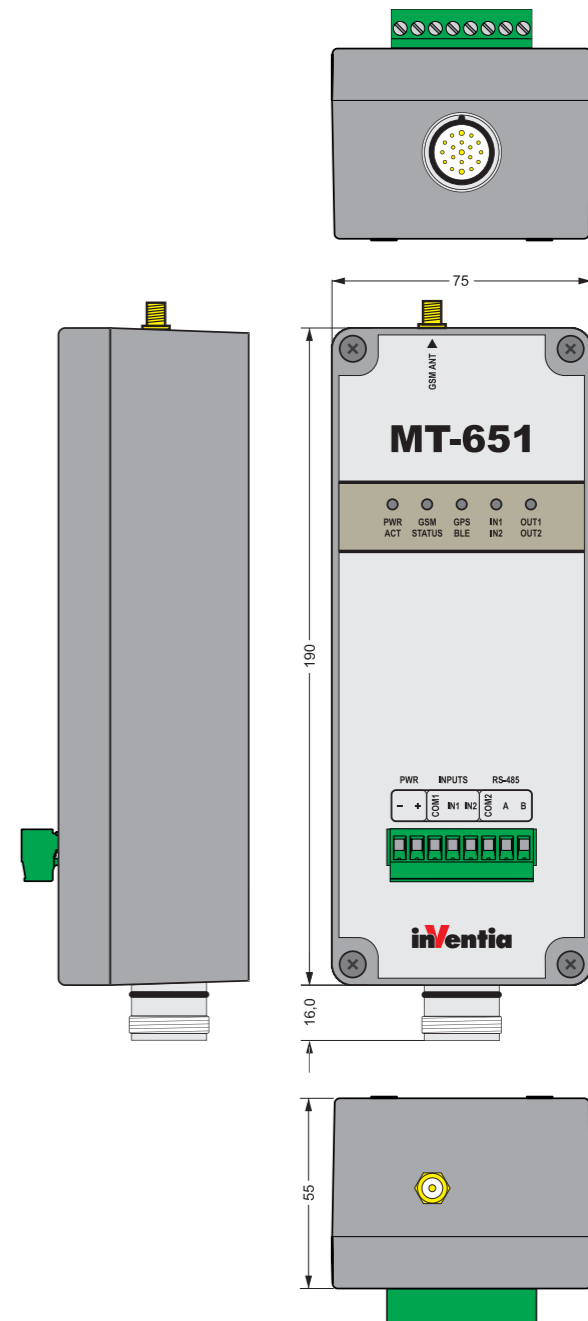
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* option

Datalogger

Capacity (internal memory)	180 000 records
Data storage on microSD card	Depends on the capacity of microSD card Support for 32GB microSD cards

Drawings and dimensions (all dimensions in millimeters)



MT-651

MT-651 telemetry module provides compact and high specification solution for remote monitoring and controlling of pipeline cathodic protection systems, tanks and other metal structures buried in the ground or submerged in water. The flexibility of module configuration allows you to adjust it to a series of installations - from the simplest to the most complex. Internal resources of the device allow for easy and secure remote configuration and implemented data protection mechanisms ensure safe operation of the system.

MT-651 module is dedicated to the system where power lines are not available.

With MT-651 module we supplied free of charge applications: MTManager for remote and local configuration, resources monitoring and firmware actualization, MT-Data Provider (OPC server, relation data base data saving engine) for communications environment for Microsoft Windows. These applications allow easy integration with available on the market popular SCADA systems.

Functionality

- Mounting in the ø100 mm measurement bollard
- Power supply by internal battery pack (external as optional)
- Built-in Quad Band GSM modem
 - 2G (GSM/GPRS EDGE 900/1800)
 - 3G (UMTS/HSPA+ 900/2100)
- Communication interfaces: USB, RS-485, Bluetooth 4.x*
- Dual-SIM technology – access to 2 independent GSM networks ensures superior availability
- 2 binary inputs (one of them operates with pull up to the ground, one voltage sens.)

- 2 optoisolated groups of analog inputs where each of them contains 2 differential inputs (configurable measurement range 0–10 V or 0–100 V) and 1 dedicated input 0–100 mV)
- 2 optoisolated binary outputs (one NC type, second for control external bistable relay)
- Execute of measurements in the synchronous mode
- Scheduler of measurements and tasks with possibility of modification by user
- Built-in GPS receiver for time synchronization
- The accelerometer to detect tampering with the device or the devastation attempts (included unauthorized movement)
- Remote configuration, communication, monitoring and firmware upgrade via GPRS
- Internal temperature sensor
- Detection of main power failure and battery monitoring
- 5 status LEDs (digital I/O states, Power supply status, GSM status and activity, GPS status)
- Data logger with 0,1 second resolution stored data events in flash memory (capacity 180000 records)
- Possibility to store data on the microSD card
- Ability to integrate with SCADA system (OPC DA, OPC UA, ODBC and CSV support)
- Transmission mode:
 - GPRS/HSDPA - packet transmission
 - SMS
- Configurable access security – IP and Phone list, optional password
- User friendly configuration software
- Open communication protocol OPEN2

* option



2DI/2DO

6AI



DIN RAIL

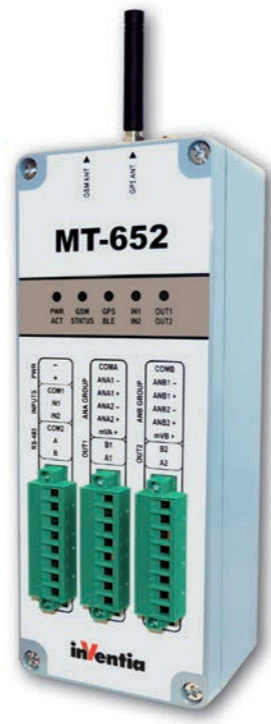


RS-485



MT-652 – Telemetry module for Cathodic Corrosion Protection Systems

- 6 measurement channels
- Measurement of AC and DC voltages
- Measurement in the range of microvolts
- GSM/GPRS/EDGE and UMTS/HSDPA packet transmission
- Dual-SIM technology
- Additional binary inputs and outputs
- Built-in GPS receiver and accelerometer
- Internal temperature sensor
- Local communication over USB, RS485 and Bluetooth Low Energy *
- Remote communication via GPRS and SMS
- 3 years warranty



General

Dimensions without connectors (length x width x height)	190 x 75 x 55 mm
Weight	900 g
Operating temperature	-20 to +55 °C
Protection class	IP65

GSM/GPRS Modem

Modem type	uBlox Sara-U270
Frequency range:	2G: 900/1800 MHz 3G: 900/2100 MHz
Antenna	50 Ω
GSM antenna connector	SMA-m
GPS antenna connector	SMA-m

Power supply

Voltage range (DC)	7-30 V
Internal battery backup	Li-Ion battery, 2.6 Ah
Input current (for 24V)	Idle 800 μA Active 70 mA, 200 mA (charging) Max 0,7 A

Inputs IN1, IN2

Input voltage range	-30 to +30V
Input resistance	5,4 kΩ typ.
Input voltage ON (1)	> 9 V min
Input voltage OFF (0)	< 3 V max.
Minimum pulse length	5 ms

Outputs OUT1, OUT2

Recommended average current for single output	100 mA
Voltage switching AC/DC	60 V max
Single output current	1 A
Output resistance in the ON (1) state	0,5 Ω max

Two group of optoisolated input with common ground (ANA, ANB)

0-100 mV input: mVA, mVB	
Measurement range	±100 mV
Measurement resolution	1 μV
Accuracy DC	±0,1 %
Input resistance	>1 MΩ
0-100 V input: ANA1, ANA2, ANB1, ANB2	
Measurement range DC	±10 V; ±100 V
Measurement range AC	100 V
Measurement resolution	1 mV
Accuracy DC	±0,1 %
Input resistance	>10 MΩ

Internal temperature sensor

Accuracy	±1 °C
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GPS receiver

Time synchronization accuracy	±1 ms
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Communication interfaces RS-485, USB, BLE

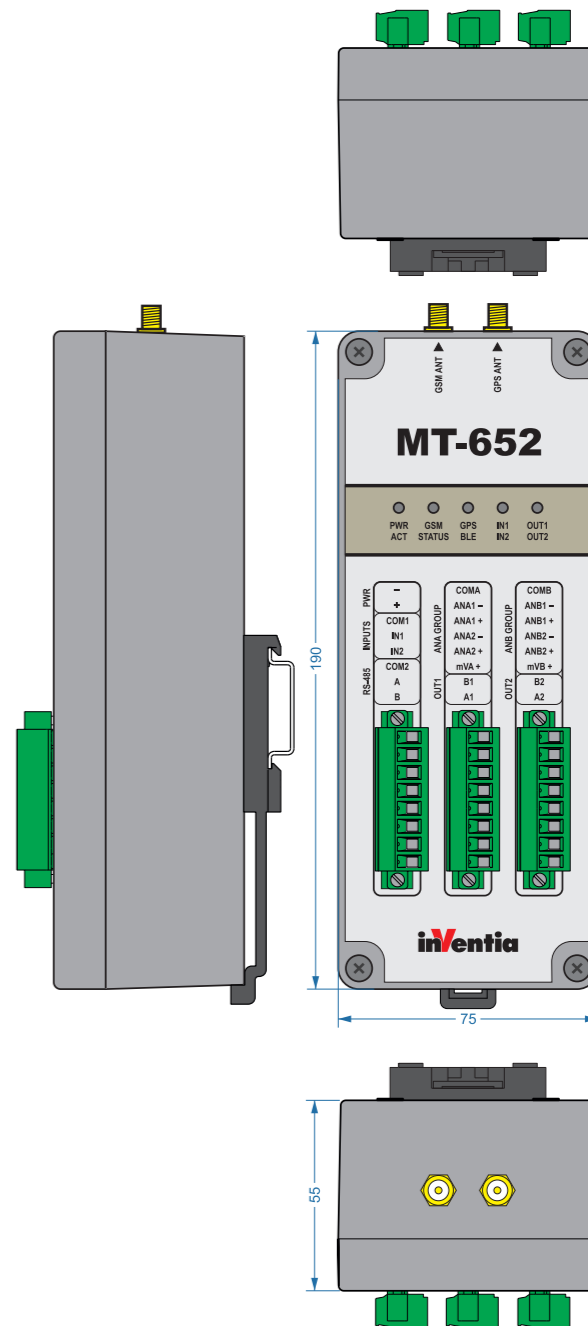
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* option

Datalogger

Capacity (internal memory)	180 000 records
Data storage on microSD card	Depends on the capacity of microSD card Support for 32GB microSD cards

Drawings and dimensions (all dimensions in millimeters)



MT-652



2DI/2DO

6AI



DIN RAIL



RS-485



MT-652 telemetry module provides compact and high specification solution for remote monitoring and controlling of pipeline cathodic protection systems, tanks and other metal structures buried in the ground or submerged in water. The flexibility of module configuration allows you to adjust it to a series of installations - from the simplest to the most complex. Internal resources of the device allow for easy and secure remote configuration and implemented data protection mechanisms ensure safe operation of the system.

With MT-652 module we supplied free of charge applications: MTManager for remote and local configuration, resources monitoring and firmware actualization, MT-Data Provider (OPC server, relation data base data saving engine) for communications environment for Microsoft Windows. These applications allow easy integration with available on the market popular SCADA systems.

Functionality

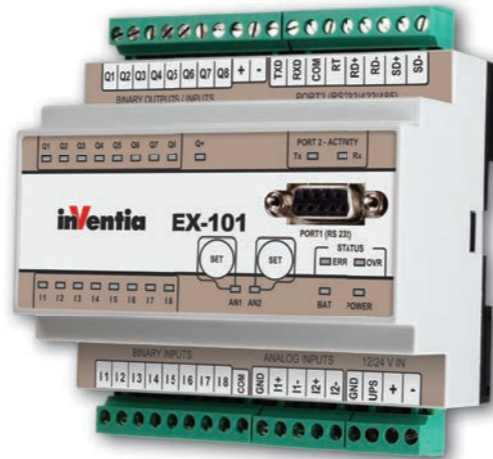
- DIN 35mm rail mounting
- Power supply by external DC unit or internal battery pack
- Built-in Quad Band GSM modem
 - 2G (GSM/GPRS EDGE 900/1800)
 - 3G (UMTS/HSPA+ 900/2100)
- Communication interfaces: USB, RS-485, Bluetooth 4.x*
- 2 optoisolated binary inputs (with common ground)
- 2 optoisolated groups of analog inputs where each of them contains 2 differential inputs (configurable measurement range 0–10 V or 0–100 V) and 1 dedicated input 0–100 mV)
- 2 optoisolated binary outputs (60V, 1A)

- Dual-SIM technology – access to 2 independent GSM networks ensures superior availability
- Execute of measurements in the synchronous mode
- Scheduler of measurements and tasks with possibility of modification by user
- Built-in GPS receiver for time synchronization
- The accelerometer to detect tampering with the device or the devastation attempts (included unauthorized movement)
- Internal built-in Li-ion battery (2600 mAh) for energy backup in the module version powered by DC power supply unit
- Remote configuration, communication, monitoring and firmware upgrade via GPRS
- Internal temperature sensor
- Detection of main power failure and battery monitoring
- 5 status LEDs (digital I/O states, Power supply status, GSM status and activity, GPS status)
- Data logger with 0,1 second resolution stored data events in flash memory (capacity 180000 records)
- Possibility to store data on the microSD card
- Ability to integrate with SCADA system (OPC DA, OPC UA, ODBC and CSV support)
- Transmission mode:
 - GPRS/HSDPA - packet transmission
 - SMS
- Configurable access security – IP and Phone list, optional password
- User friendly configuration software
- Open communication protocol OPEN2

* option

EX-101 – Modbus RTU Slave I/O Module

- Binary inputs and outputs
- Analog inputs 4-20 mA (2)
- Serial communication port for external devices (RS 232/422/485), isolated
- Data logger with 0,1 sec. resolution
- RTC Real Time Clock
- Programmable logic controller (PLC)
- Modbus RTU communication protocols
- Removable terminal blocks
- Easy configuration software



General

Dimensions (length x width x height)	105 x 86 x 58 mm
Weight	300 g
Mounting	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Protection class	IP40
Max. voltage at all connectors relative to device's GND.	60 Vrms max.

Power Supply

Voltage range (DC) 12,24V	10,8 – 36 V
AC (24V)	18 – 26,4 Vrms
Input current (A) (for 12V DC)	Active 0,20
Input current (A) (for 24V DC)	Active 0,10

Inputs I1 – I8

Input voltage range	-36 – 36 V
Input resistance	5,4 kΩ
Input voltage ON (1)	> 9 V lub < -9 V
Input voltage OFF (0)	-3 V – 3 V

Inputs Q1 – Q8

Maximum input voltage	36 V
Input resistance	5,4 kΩ tzp.
Input voltage ON	>9 V min
Input voltage OFF	<3 V max.

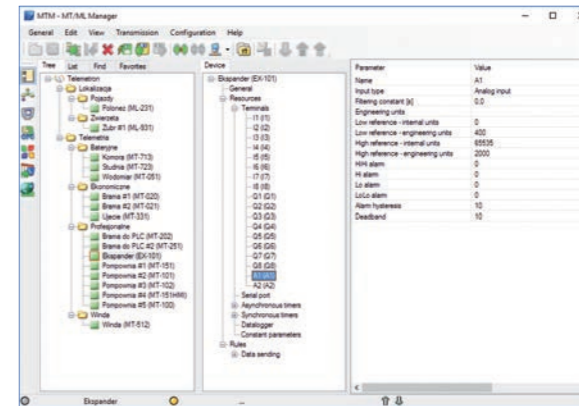
Outputs Q1 – Q8

Recommended average current for single output	50 mA
Single output current	350 mA max.
Mean current for all outputs	400 mA max.
Voltage drop at 350mA	<3,5 V max.
Off state current	<0,2 mA max.

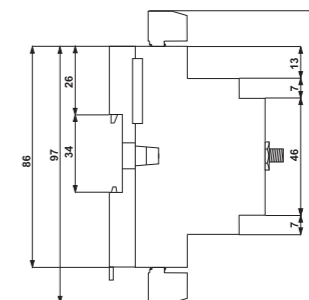
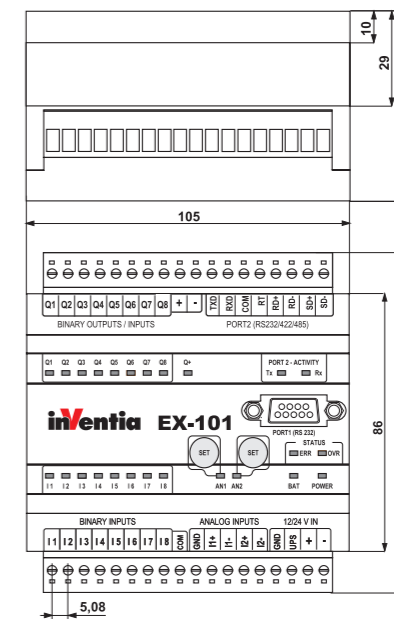
Analog inputs A1, A2 (4 – 20 mA)

Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	25 Ω typ.
Voltage drop at 20mA	<5 V max.
A/D converter	10 bit
Accuracy	±1,5 % max.
Nonlinearity	± 1 % max.

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



The EX-101 is an extension module for MT family of telemetry modules. It is optimized for use in advanced measurement systems equipped with 12/24V power source. Additionally, it can act as a universal I/O station with galvanically isolated RS232/485/422 Modbus RTU interface. The ability to run local control program allows to use EX-101 module as freely programmable PLC.

Functionality

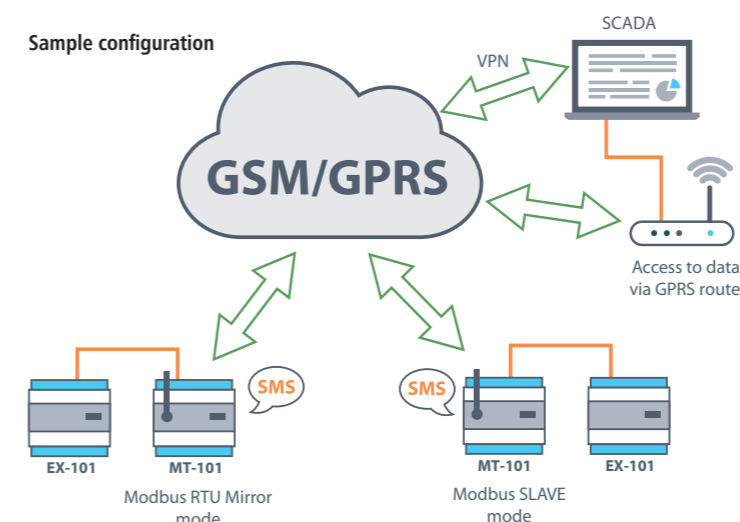
- All binary inputs can be configured as counters or frequency-to-analog converters (0-2kHz)
- Programmable control functions using I/O's and configurable, event triggered flags (data logging, output control)
- Unsolicited messaging
- Event triggered Data Logger
- Simple, multipoint alarm configuration for both binary and analog inputs
- Additional manual alarm level setting capability for analog inputs A1, A2 (front panel push buttons)
- External, optoisolated RS 232/422/485 serial port for data transmission
- Configurable access security - password
- DIN rail mounting
- Power supply 12/24V DC, 24 V AC
- Removable terminal blocks
- Diagnostic LED's (status, serial communication activity, I/O status)
- Local logging of measurement results
- Local execution of user program
- 4 programmatic clocks TMRx – Asynchronous and Synchronous
- Can be use like standalone programmable PLC
- Main power failure signalization – FS1_UPS
- Support for external text or graphics modbus displays

Resources

- 8 optoisolated binary / counter inputs 24V DC (I1 – I8)
- 8 configurable binary outputs / inputs / counters 24 V DC (Q1 – Q8)
- 2 optoisolated analog inputs 4-20 mA (8 bit acc./10 bit res.) with configurable hysteresis and filtration
- Isolated serial port RS 232/485/422
- RTC with external synchronization functions
- Firmware Flash memory with local update capability



Sample configuration



8-16DI / 0-8DO

2AI



DIN RAIL

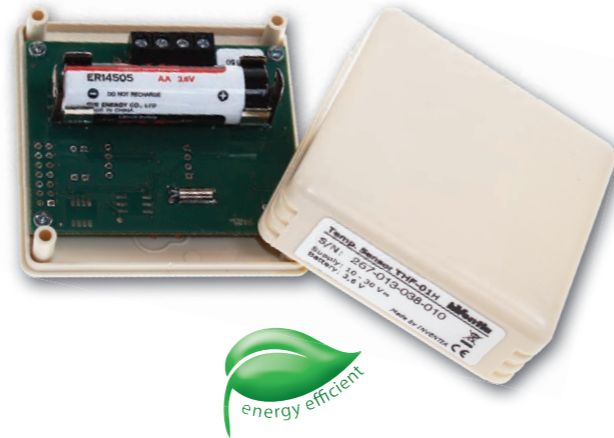
RS-232

RS-232/422/485

EX-101

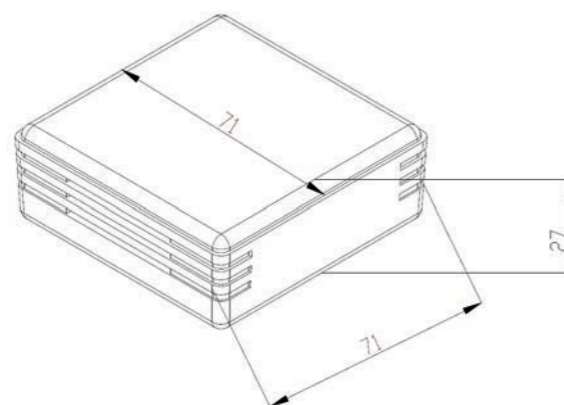
EX-101

- Dedicated temperature sensor for MT series telemetry modules
- Four versions available:
 - THF-01 – temperature measurement,
 - THF-01 H – temperature and humidity measurement,
 - THF-01 P – temperature and atmospheric pressure measurement
 - THF-01 HP – temperature, humidity and atmospheric pressure measurement
- Temperature measuring range: -40 °C to + 85 °C
- Humidity measuring range: 1.3% – 100%
- Atmospheric pressure measuring range: 513 hPa – 1100 hPa
- High accuracy and stability of measurements
- Low power consumption
- Measuring period: 1 minute
- Signals measured in frequency outputs form
- Two power sources: AC adapter or internal lithium battery
- Protection degree IP40
- Protective gel covering the electronics
- Wall mounting
- ABS housing of dimensions 71 x 71 x 27 mm
- 3 year warranty period



The compact THF-01 module extends the measurement capabilities of selected MT series telemetry modules. Depending on the version, the THF-01 sensor measures physical quantities such as temperature, humidity and atmospheric pressure. The system is designed for telemetric modules equipped with pulse inputs operating in the frequency measurement mode, thus the typical analog inputs are not required for the measurement. The sensor housing allows mounting on any flat surface by means of a double-sided adhesive tape. The module is designed for indoor and outdoor use, enabling ambient climatic conditions monitoring. The device design incorporates an external source of power or direct power from an optional internal lithium battery (dedicated for use with battery-powered telemetry modules).

Drawings and dimensions (all dimensions in millimeters)



General

Supply voltage:	
From an external source	10 – 30 VDC
From the internal lithium battery	3,6 VDC
Supply current (without output load)	1 mA
Measurement period	1 min
Battery operating time (3.6 V / 2.5 Ah)	10 years
Operating temperature range	-40 to +85 °C
Protection degree	IP40
Housing dimensions	71 x 71 x 27 mm

Temperature measurement:

Output frequency	0 °C = 10 Hz (5 °C/1 Hz)
Measuring range	-40 to 85 °C
Accuracy for 25 °C	± 0,5 °C
from -10 °C to +85 °C	± 1 °C
from -14 °C to +85 °C	± 3 °C
Resolution	0,1 °C

Humidity measurement:

Output frequency	50 % = 10 Hz (5 %/1 Hz)
Measuring range	1,3 – 100 %
Accuracy	± 5 %
Resolution	0,1 %

Atmospheric pressure measurement:

Output frequency	1000 hPa = 1 Hz (50 hPa/1 Hz)
Measuring range	513 hPa – 1100 hPa
Accuracy	± 4 hPa
Resolution	1 hPa



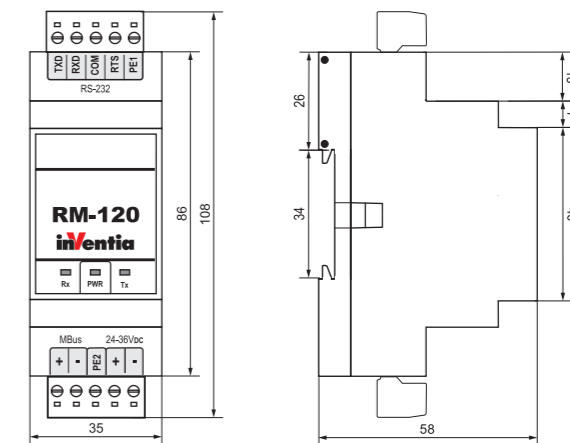
The RM-120 converter module is used in installations where it is necessary to read object parameters from devices that support M-Bus communication (electricity and heat meters, PLCs). The MT-101 or MT-202 telemetry module provides wireless communication with distributed M-Bus nodes using packet-switched GPRS data transmission and SMS or e-mail alerting. The RM-120 can handle up to 120 devices with available M-Bus slave protocol. In addition to the galvanic isolation of communication ports, the system also provides adequate protection against possible short-circuits and over-voltages on the M-Bus side.

Description of the connectors available in RM-120 converter module

Connector	Description
+ (Mbus)	Positive M-Bus terminal
- (Mbus)	Negative M-Bus terminal
PE2	M-Bus ground
- (24 – 36VDC)	Negative supply terminal of the RM-120 module
+ (24 – 36VDC)	Positive supply terminal of the RM-120 module
TXD	Output terminal of the RS-232 transmitter
RXD	Input terminal of RS-232 receiver
COM	Common terminal of the RS-232 circuit
RTS	Optional signalling of the converter when connected to the COM PC port of (unused when connected to MT module)
PE1	Ground of the RS-232 circuit

- Supports up to 120 M-Bus devices per single bus
- Power on the RS-232 communication port is not required
- Galvanic isolation of RS-232 and M-Bus communication ports
- Supports rates of 1200, 2400, 4800, 9600 bps
- Built-in M-Bus short-circuit and over-voltage protection
- 3 diagnostic LEDs
- Detachable terminal blocks
- Mounting on DIN rail
- ABS housing
- 24 months warranty period

Drawings and dimensions (all dimensions in millimeters)



Technical parameters:

Rated supply voltage Vz	21,6 – 42 VDC
Maximum current consumption by one M-Bus device	1,5 mA
Maximum number of supported M-Bus devices	120 pcs.
RS-232 -> M-bus transmission	0 Vz 1 Vz-12V
M-Bus -> RS-232 transmission	0 0 – 1,5 mA 1 11 – 20 mA
Operating temperature	-20 – 55 °C
Protection degree	IP40
Dimensions (L x W x H):	35 x 86 x 58 mm
Weight	0,08 kg



RS-232



M-BUS

THF-01

RM-120

MT-UPS-1 – Microprocessor controlled UPS module

- Special, buffered power supply (UPS) for professional series of MT telemetry modules (MT-021, MT-100, MT-101, MT-102, MT-151, MT-202)
- Wide range of battery capacities from 2,4 Ah to 9Ah
- Max. output current 1,5 A
- Can be supplied from a photovoltaic cell (max. effect due to voltage adjustment)
- Microprocessor controlled charging of battery
- Integrated circuit for battery protection
- 6 diagnostic LED diodes
- Fast DIN rail mounting
- IP40 protection class
- 3 year warranty



MT-UPS-1 is a modern, digitally controlled buffered power supply acting as an UPS for telemetry modules and external receivers when main supply fails. The module can cooperate with any mains supply delivering 24 V DC (main power source) and an external SLA battery (backup power source) with 12 V nominal voltage. It can be used for batteries with 2,4 Ah to 9 Ah capacity. The module has a special output to warn of main supply failure – a classic UPS function. The circuit charges and maintains the battery when main supply is active (mains or a photovoltaic cell). The algorithm for auto-adjustment for photovoltaic cell uses the energy delivered by photo voltaic cell under poor light conditions.

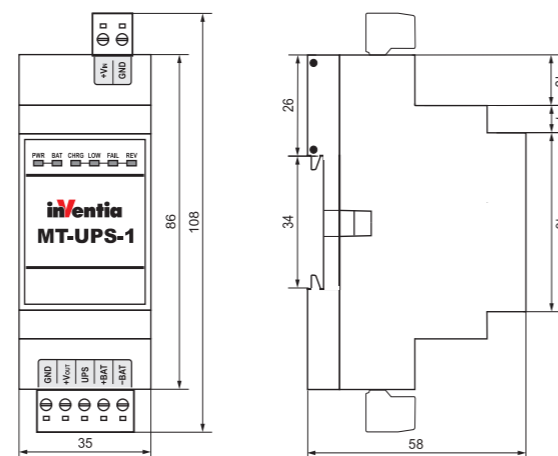
Functionality

- LED diagnostic diodes reflect the current unit status. Detachable terminals with clear marking
- UPS compatible signal output for attachment of MT series telemetry modules
- Independent of supply source stabilising of output voltage, secures performance under transmission (higher energy consumption)
- Support for photovoltaic cells with max. effect at 16–18 V voltage
- Step-up and step-down microprocessor controlled converter
- Short circuit protection at inputs and outputs
- Parametrising of voltages threshold protects the battery
- Adapted to 12 V SLA batteries with 2,4 Ah to 9 Ah capacity
- Wide operating temperature range -20 to +55 °C
- Main supply voltage from 21,6 VDC

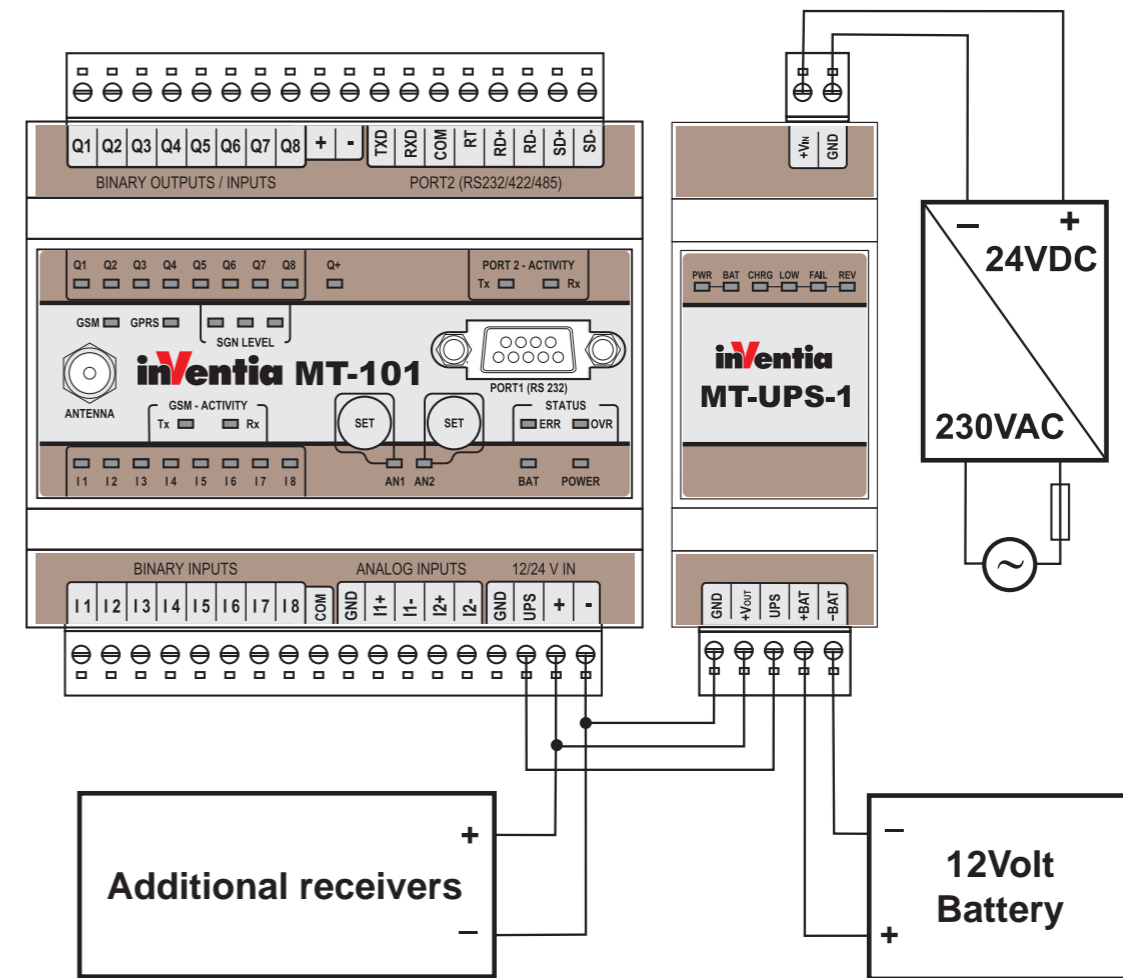
Technical data:

Input voltage (main supply)	24 VDC +/-10%
Charging current	from 0,25 A to 0,9 A
Nominal output voltage	24 VDC (21 VDC from battery)
Nominal output current	0,5 A
Highest output current	1,5 A (max 10 s)
Battery cut off voltage	<10,5 V
Ripple (between peaks)	<1 %
Operating temperature	-20 – 55 °C
Storage temperature	-25 – 70 °C
Dimensions (mm)	86 x 35 x 58
Protections class	IP40

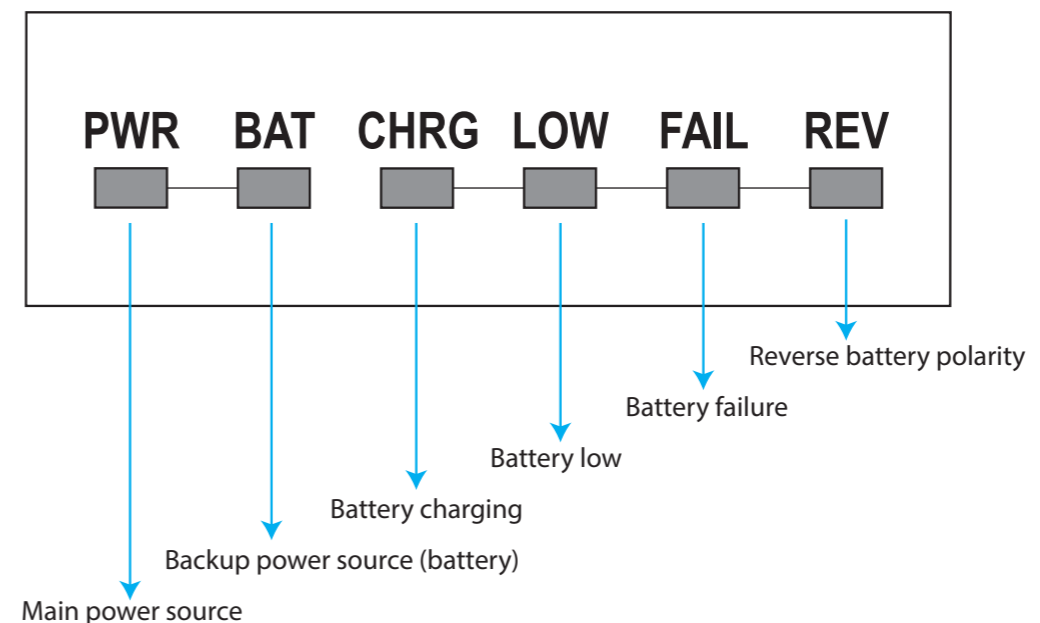
Drawings and dimensions (all dimentions in millimeters)



An example of connection of MT-UPS-1 to MT-101 telemetry module



MT-UPS-1 Status LED diodes



WARRANTY
3
YEARS

energy efficient

DIN RAIL

MT-UPS-1

MT-UPS-1



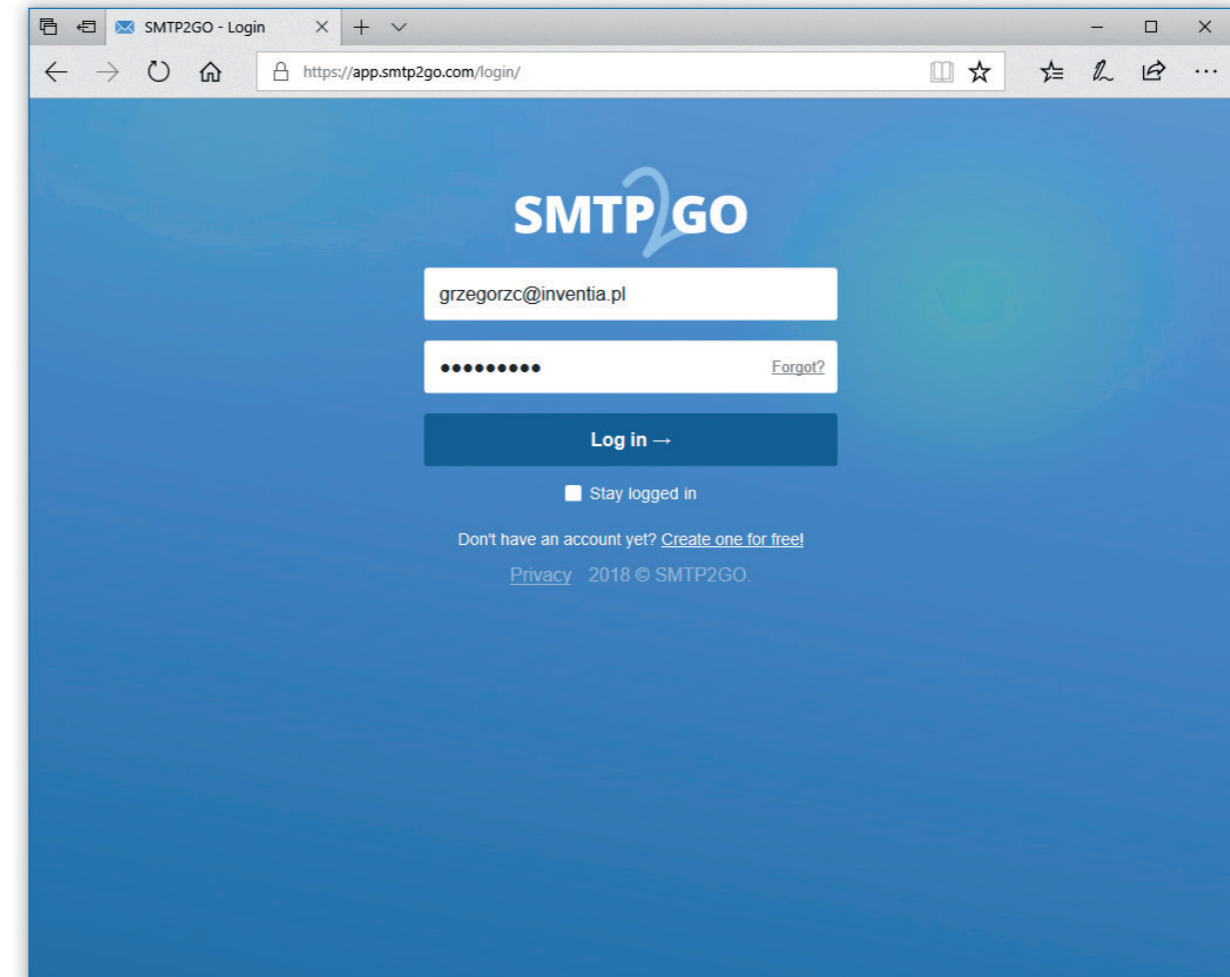
Sending **e-mail** notifications from MT-151

The MT-151 module with firmware version 2.04.01 is now capable of sending e-mails. Implementation of this functionality in the module allows you to send text messages using an external SMTP server.

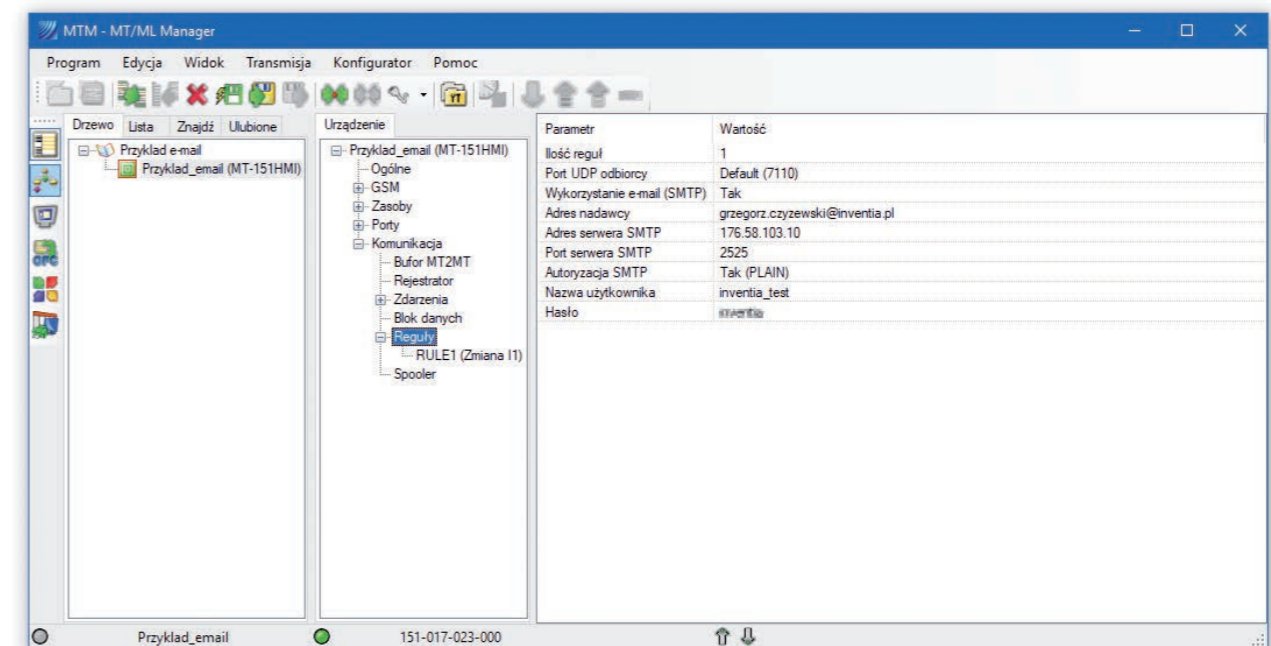
The server should allow sending unencrypted messages. The content of the message may contain any UTF-8 characters, including Polish diacritics, but also letters from the Arabic, Greek, Persian or Cyrillic alphabet. The content can be enriched with dynamic elements of a value depending on the module status, such as analog input measurements, binary input states, signal level, time stamp and others.

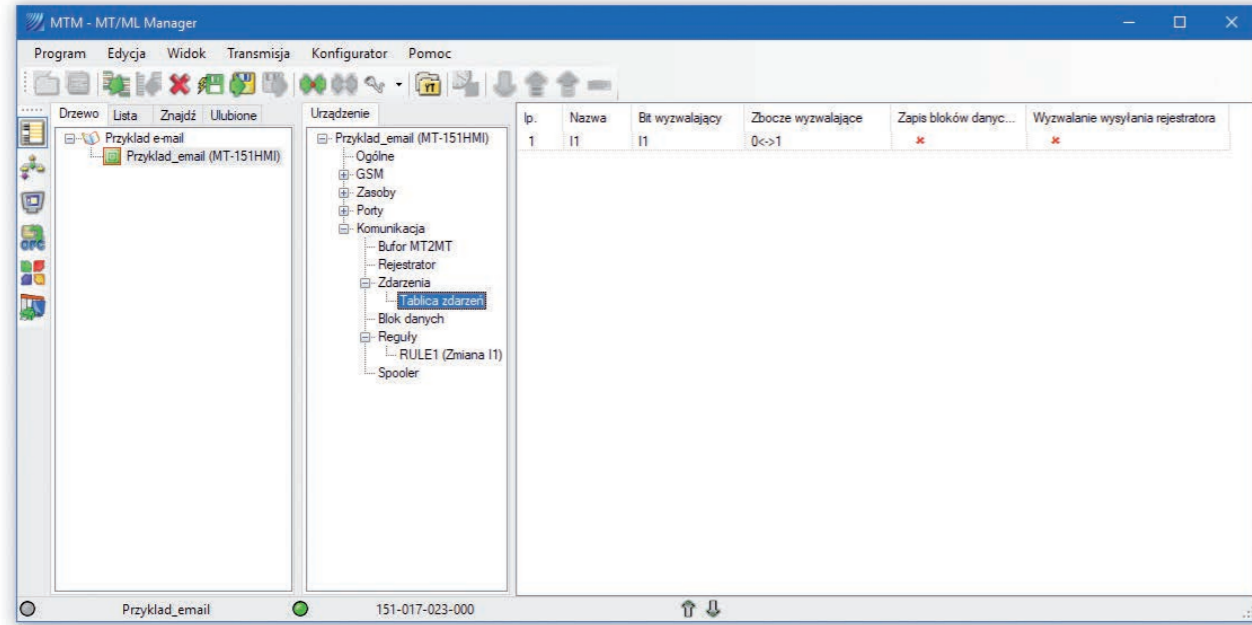
The first step is to provide access from the module to the SMTP server enabling communication without the need to use encryption and SSL / TLS protocols. For SIM cards working with the Internet, we recommend using the service offered on the SMTP2GO.com website (1000 e-mail messages per month for free).

If the module has already been configured to connect to APN (2G / 3G network), you can start adding SMTP server support – it is required to start the service (the parameter **Use email (SMTP)** should be set to **Yes**) and enter the SMTP server address (**SMTP server address**), its port (SMTP server port), authorization methods (**SMTP authentication**), as well as the user name (**Username**) and password (**Password**) necessary to access the SMTP server.



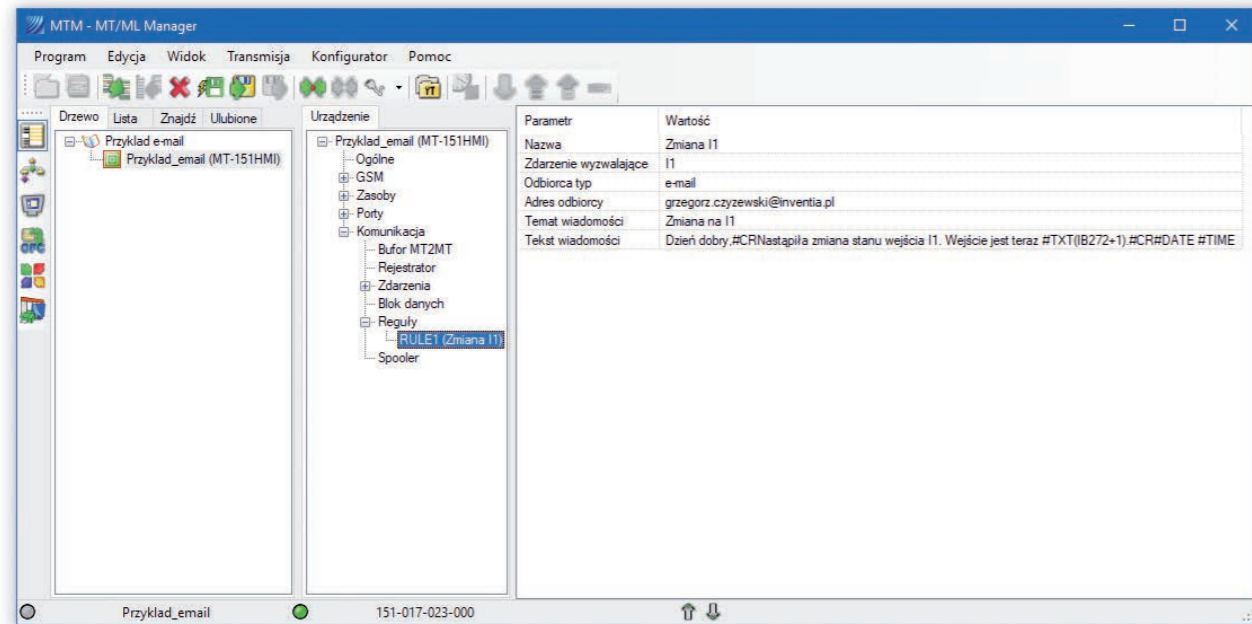
The next step is to add an event that triggers the sending of e-mail messages. For the test purposes, the best input is the one which state we can easily change, e.g. binary input.





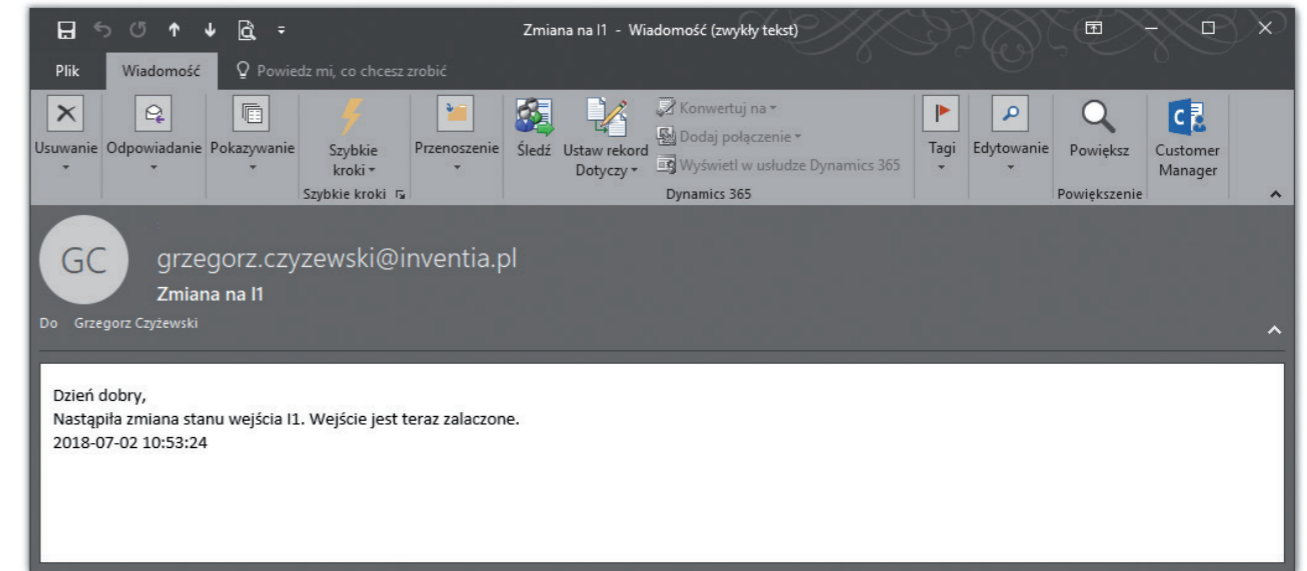
The last element of the configuration is the definition of the rule sending the e-mail. It comes down to selecting the event configured in the previous step as parameter settings (**Trigger event**), indicating the type of message (**Recipient type**) as e-mail, indicating the recipient's address (**Recipient address**) and the title and content of the message.

In the message body, you can use UTF-8 encoded characters and SNCS commands that allow you to place dynamic content and special characters (e.g., a newline character). More details on SNCS can be found in the documentation of MT-151 LED and MT-151 HMI devices.

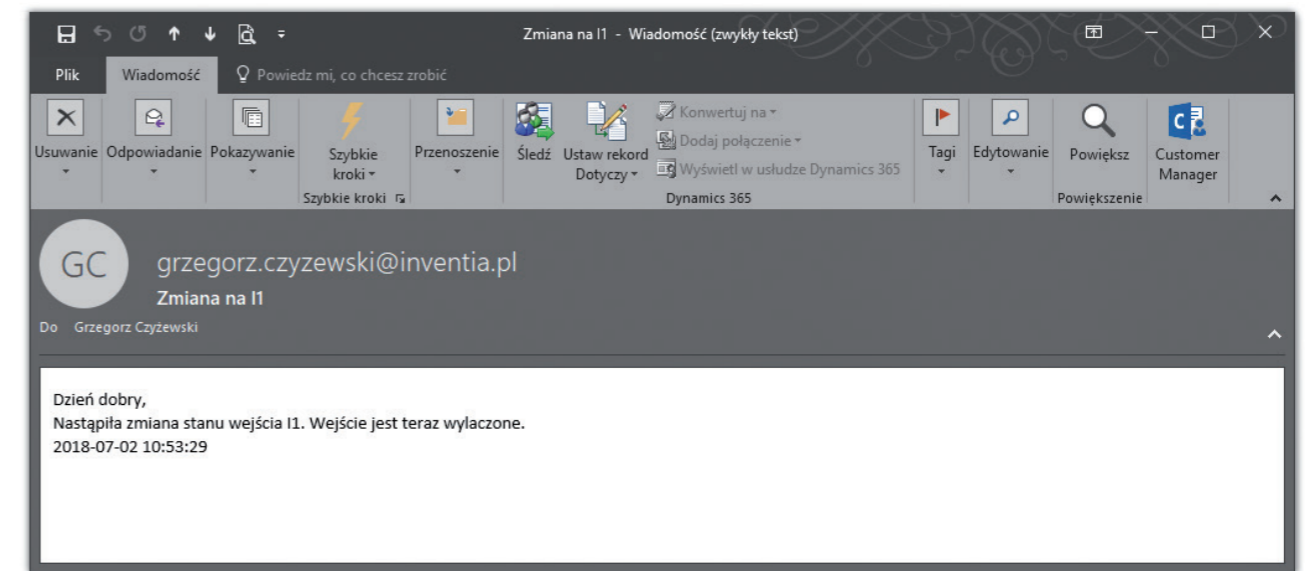


The above example uses the text:
 Dzień dobry,#CRNastąpiła zmiana stanu wejścia I1. Wejście jest teraz #TXT (IB272+1) .#CR#DATE #TIME,
 which after changing state I1 sends different content, depending on the status of this input:

For changing the logic state I1 from „0” to „1”



For changing the logic state I1 from „1” to „0”



Based on the above example, you can build your e-mail notifications by expanding the functionality of existing systems or by offering additional functionality in new implementations. We also invite you to contact our technical support department.



I/O simulators for telemetry modules

For some models of telemetry modules, the I/O simulators have been developed. They allow you to easily test the functionality of the module, the correctness of configuration settings, as well as the actual operation of the user's application program. Here we present available models of simulators.

MT-IS-02x – input simulator for MT-020, MT-021 modules

The MT-IS-02x simulator works with MT-020 and MT-021 modules and enables:

- feeding the binary inputs I1 – I4 by voltage 0 V (corresponding to the logic L) or +12 V (corresponding to the logic H, signaled by lighting the green LED), using switches;
- supplying the external voltage to I1 – I4 inputs;
- feeding the analog input AN1 by the voltage in the range of 0 – 10 V (signaled by the brightness of the white LED), or by the current in the range of 4 – 20 mA (signaled by the brightness of the yellow LED), using a potentiometer;
- connecting an external PT100 sensor or an external voltage converter or an external current converter to the analog input AN1;
- feeding the analog input AN2 by the voltage in the range of 0 – 10 V (signaled by the brightness of the white LED), or by the current in the range of 4 – 20 mA (signaled by the brightness of the yellow LED), using a potentiometer;
- connecting an external NTC sensor or an external voltage converter or an external current converter to the analog input AN2;
- attaching the Dallas pellet to the No. 1 1-Wire input;
- the connection of external elements to both 1-Wire inputs.

The simulator should be powered by an external 13 – 20 VDC power supply (typically 15 VDC).

MT-IO-101 – simulator for MT-101 and EX-101 modules

The MT-IO-101 simulator is designed to work with MT-101 and EX-101 modules. This model consists of two boards that are plugged into the module terminal block sockets and enables:

- feeding the binary/counter inputs I1 – I8 by voltage 0 V (corresponding to the logic L) or +12 V (corresponding to the logic H, signaled by lighting the green LED), using switches;
- supplying the external voltage to I1 – I8 inputs;
- feeding the analog input I1 and I2 by the current in the range of 4 – 20 mA (signaled by the brightness of the yellow LED), using a potentiometer;

- supplying the analog input I1 from an external current source;
- connection to binary outputs Q1 and Q2 buffered with relays,
- resistive load up to 250 VAC / 2 A or inductive load up to 125 VAC / 0.5 A;
- monitoring of logic states of Q1 – Q8 outputs signaled by the lighting of red LEDs;
- the connection of the RS-232 serial port,
- simulation of the battery's connection to the UPS input.

The simulator should be powered by an external 13 – 30 VDC power supply (typically 15 VDC).

MT-IO-151 – simulator for MT-151 and MT-151 V2 modules

The MT-IO-151 simulator works with MT-151 LED, MT-151 HMI, MT-151 LED V2 and MT-151 HMI V2 modules. This model consists of two boards that are plugged into the module terminal block sockets and enables:

- feeding the binary/counter inputs I1 – I16 by voltage 0 V (corresponding to the logic L) or +12 V (corresponding to the logic H, signaled by lighting the green LED), using switches;
- supplying the external voltage to I1 – I16 inputs;
- feeding the analog inputs I1 – I4 by the current in the range of 4 – 20 mA (signaled by the brightness of the yellow LED), using a potentiometer;
- supplying the analog input I1 – I4 from an external current source;
- connection to binary outputs Q1 and Q2 buffered with relays,
- feeding the analog voltage inputs I1 – I4 by the voltage in the range of 0 – 10 V (signaled by the brightness of the white LED);
- the connection of power outputs to the COM2 and Q+ terminals;
- monitoring of logic states of the Q1 – Q12 outputs signaled by the lighting of red LEDs;
- attaching external loads to the Q1 – Q12 outputs;
- the connection of opto-isolated Port 1 (RS-232/485);
- the connection of Port 2 (RS-232);
- the connection of an external 12V battery.

The simulator should be powered by an external 13 – 30 VDC power supply (typically 15 VDC).

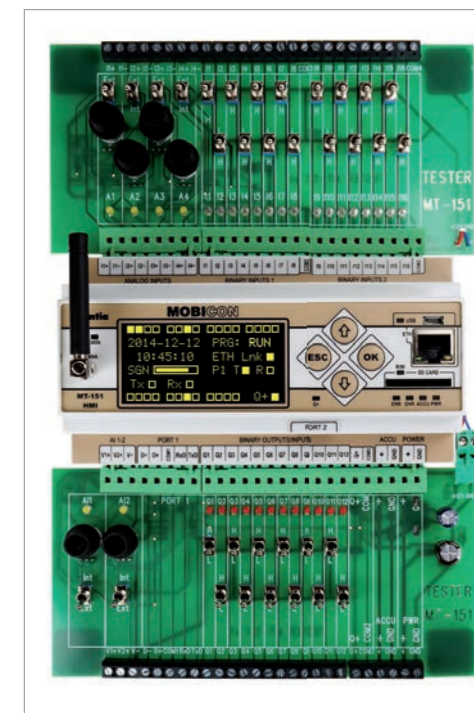
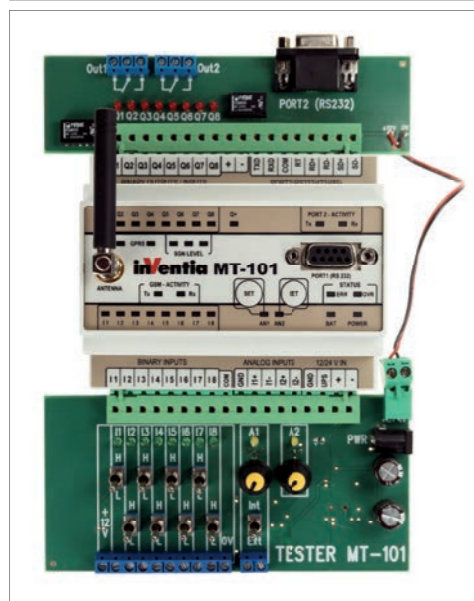
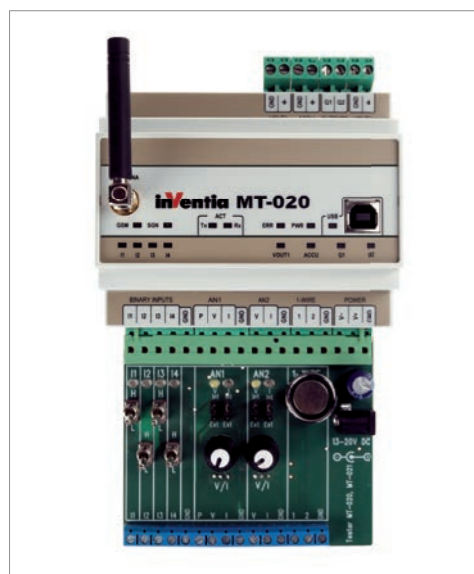
MT-IO-331 – simulator for MT-331 module

The MT-IO-331 simulator works with MT-331 module and enables:

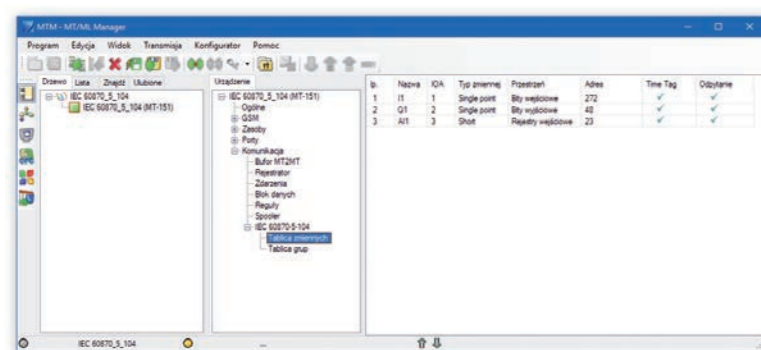
- feeding the analog voltage inputs AN1 and AN2 by the voltage in the range of 0 – 10 V (signaled by the brightness of the white LED), using a potentiometer;

- ground shorting of binary inputs I3, I4, I5, I6, which is signaled by lighting green LEDs;
- shorting to the ground of input I6 by means of a rotary encoder, which enables the delivery of a series of pulses and is signaled by lighting the green LED;
- signaling binary outputs states Q1 and Q2 using red LEDs;
- measuring the ambient temperature with a sensor connected to the 1-Wire input;

The simulator can be powered by an external 9 – 30 VDC power supply or from the internal battery of MT-331 module.



Implementation of the protocol: IEC 60870-5-104 in MT-151



Also, the module configuration allows for the definition of a maximum of 200 variables in the IOA address range from 1 to 1000. Each variable can be given a type and assign the address or bit appearing in the memory map, which is to be accessed through the IEC 104 protocol. Each variable may have a unique name, be marked with a time stamp and can be marked as a global variable provided in response to a global query (interrogation).

The communication capabilities of the MT-151 modules working as a Slave device (Server) have been extended by the implementation of IEC 60870-5-104 protocol (abbreviated as IEC 104). It is a TCP/IP based network protocol widely used in telematic and telemetry systems in power engineering.

Implementation of this protocol in the MT-151 module allows handling one TCP / IP client. The module listens on port 2404. The IEC protocol has been adapted based on the structure of Modbus registers, which limits the data types to a single bit (single point), a single 16-bit signed register (short scaled) and a variable with a floating decimal point written in the dual register (short float). We provide a full description of the implemented functions in the form of an interoperable table.

Addressing IEC variables (IOA)	IEC data type	Modbus space	Description
5001 – 9801	M_SP_NA_1	IB0 ... IB5799	Discrete inputs (IREG bits)
10001 – 10300	M_ME_NB_1	IRO ... IR299	Input registers
20001 – 36384	M_SP_NA_1	HBO ... HB16383	Outputs (HREG bits) – first 16384 bits (1024 registers)
40001 – 48192	M_ME_NB_1	HR0 ... HR8191	Internal Registers

By default, over 8,000 registers are available for the IEC 104 protocol. They are divided into four blocks forming a table of IEC variables. The user can access each MT-151 register by calling the "read variable" function (C_RD_NA_1) with the correct IOA address. The module responds by the value from the corresponding Modbus register/bit.

The global query is carried out by the command (C_IC_NA_1), which contains an additional parameter determining whether it is a global question (general) or asking for a specific group. The module provides eight groups of parameters to which individual variables can be assigned. Polling groups using the global read command requires the appropriate identifier for a particular group 1 – 8.

The module can also spontaneously send data based on the definitions of an event table. Each of the available 32 events has its trigger condition and the assigned data to send. They can be single variables or groups. Events can also be sent via the internal program after selecting the P1–P256 flag as the trigger source. IEC events are independent of the classic events sent by the module.

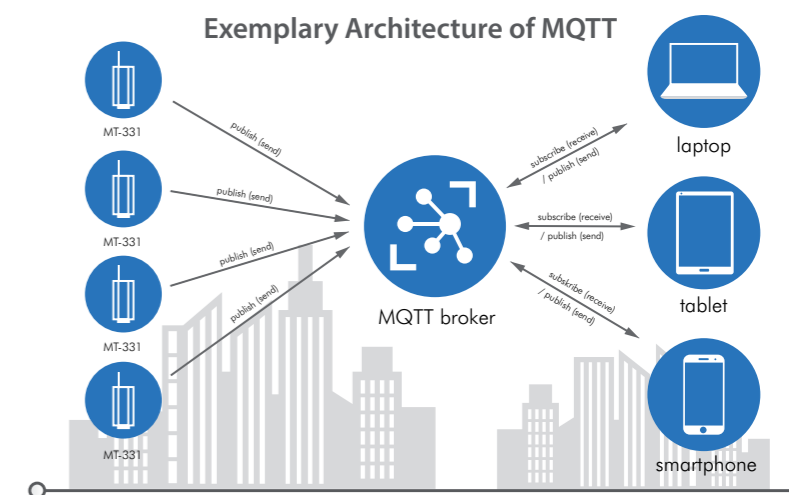
The IEC 104 protocol allows to synchronize RTC of client with server time. By default this functionality is inactive, but the module configuration allows you to enable time synchronization over IEC protocol.

MQTT protocol in MT-331 telemetry modules

The dynamically developing world of the Internet of Things continues to be affected by the lack of standardization of transmission protocols. Recently, however, the MQTT protocol (Message Queue Telemetry Transport) has been gaining in importance. The specification of MQTT protocol matches very well to the requirements of broadcasting in the world of distributed devices. This is not yet binding on the standard, but its multiple implementations make many manufacturers look favourably on its using in M2M applications and the Internet of Things. Also, Inventia decided to implement the MQTT protocol for the first time in one of its products.

We chose the MT-331 module for this purpose because it operates well in IIoT (Industrial Internet of Things) applications. The possibility of adapting the type and number of inputs / outputs to current needs, energy-saving mode allowing battery supply, energy storage in an internal lithium battery, the possibility of powering it directly from solar panels, built-in data logger, built-in 2G/3G modem and a reliable metal housing are only a few of the advantages of this model. The ease of integration of MT-331 modules with various IT cloud solutions currently provides support for the MQTT protocol.

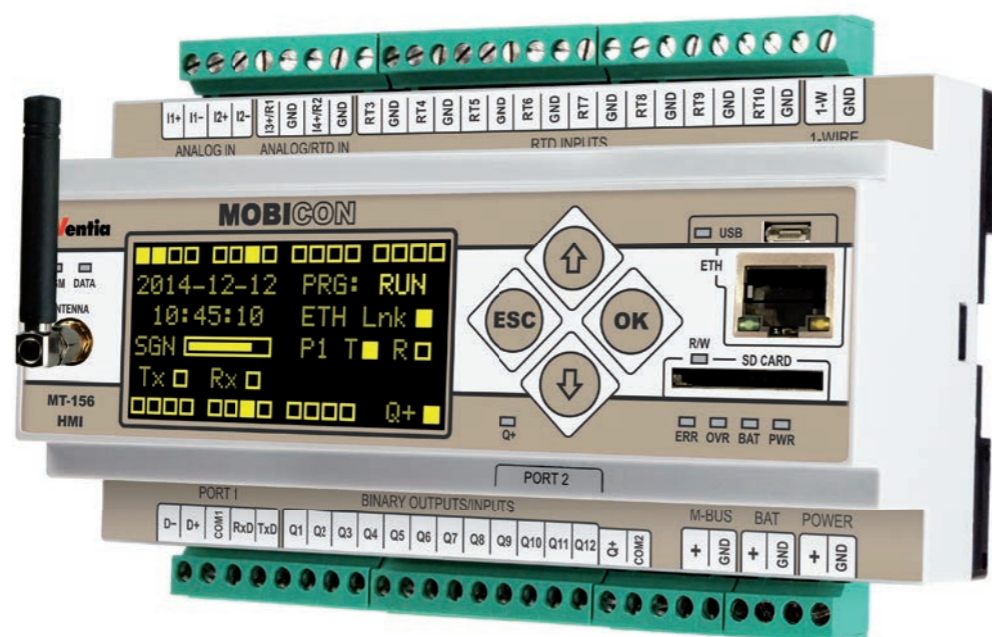
MQTT is a very light and easy-to-use data transmission protocol that does not require a large transmission bandwidth and allows you to save energy in battery-powered devices. The data transfer uses a publication/subscription pattern in which the sender (e.g. sensor or telemetry module) sends data to the broker acting as a proxy server, and the recipients communicate with the broker under the subscription of topics. After receiving a new message from the sender, the broker informs the involved clients which previously subscribed to the topic. Thanks to the standardization, the availability of ready-made brokers and client libraries, MQTT protocol support can be easily implemented on various platforms. Thanks to this, the MT-331 module can be a standard data source for systems of various suppliers. The MT-331 module uses Transport Layer Security (TLS) encryption to ensure confidentiality and integrity of transmitted data.



The MQTT protocol is a completely new approach in data transfer. The existing methods have always been based on a direct connection between the sender and the recipient, which meant the necessity of multiplying the transmission if the data were to reach many recipients. In MQTT, this task is taken over by the broker's software, which receives the data published by the source and already independently handles their sending to recipients subscribing to them, also taking care of their caching until the subscriber is available. With this approach, creating a one-to-one or one-to-many networks, is possible without any restrictions, also in cases where battery-powered modules are available only at limited time intervals.

Accepting the MQTT protocol by users does not mean finding a panacea for the standardization problem, as it is still not possible to directly connect two devices from different manufacturers. There always has to be a broker on the transaction, and the user decides what and in what form he wants to send and receive, which is de facto responsible for correct protocol configuration and data interpretation. However, this does not diminish the advantages of the adopted solution and gives hope for the ever-easier exchange of data between the massively emerging IIoT solutions.

The new telemetry controller MOBICON **MT-156 HMI**



The new model MT-156 HMI is a telemetry controller for multichannel temperature measurement designed for heating, refrigeration, air conditioning systems, boiler rooms, server rooms and other facilities that require monitoring of many PT1000 temperature sensors. The module allows connection of up to 10 PT1000 sensors and is equipped with a graphical OLED display, M-BUS port, Ethernet port and serial ports enabling, among others, communication with wireless, battery-powered temperature and humidity LoRa sensors.



The MT-156 HMI controller comes standard with a modern 3G modem. Dual-SIM technology provides access to two independent GSM networks, providing redundancy of transmission infrastructure. Rich and diverse I/O resources, along with available serial interfaces and an Ethernet port, ensure the free integration of external devices, sensors and access to the controller from external systems, using the Modbus RTU and Modbus TCP protocols. Detachable terminal blocks, divided into segments, facilitate installation and service works. Ten PT1000 inputs give the possibility of direct connection of standard resistive sensors, ensuring simultaneous temperature measurement at many points. An additional RS-232 serial interface with 5 VDC / 500 mA DC power supply enables connecting a LoRa radio sensor hub (model IOT-RG-01) or any device in the RS-232 standard requiring a supply voltage in the range from 0 to 5 VDC. The MT-156 HMI model is also equipped with an M-BUS port. Data exchange with external energy meters or heat counters does not require an external converter. The high performance of the bus allows you to connect up to 16 M-BUS slave devices.



The MT-156 HMI unit, like other MOBICON series telemetry controllers, provides functionality typical for programmable logic controllers (PLC), i.e. support for a local user program (control algorithms, data processing, calculations). The user program code can be written in one of three available editors: text, MTprog conditions sheet and ladder diagram, which are supplied with the free MT Manager utility software. The dozens of logic and arithmetic functions available in the program editor are supplemented with the ability to define up to four PID controllers with the valve control option. The user program and telemetric module configuration parameters are stored in the internal flash memory. It is important for some industrial applications that it is possible to secure the controller's configuration and program with a password and to provide a lock before reading them to protect intellectual property.

In addition to the measurements and control functions, MT-156 HMI enables data logging by collecting data records according to a defined configuration in the non-volatile internal memory of the controller. Measurement data can be additionally stored on an external SD memory card. The memory card can also be used to create a backup copy of the module's configuration as well as to locally update the firmware.

MT-156 HMI is equipped with a graphic OLED display. Using a convenient display menu, the user can easily present text, any register, or marker from the internal memory of the controller, a configured graph or diagram. Using the dedicated menu, in addition to changes in the values of outputs and internal registers of the controller, you can also change the name of the module giving the unique identifier of the object. Service screens were also designed so that the user can enter basic configuration parameters without a computer connection, i.e. the PIN number for the SIM card, or select the GSM operator's network type (2G/3G).

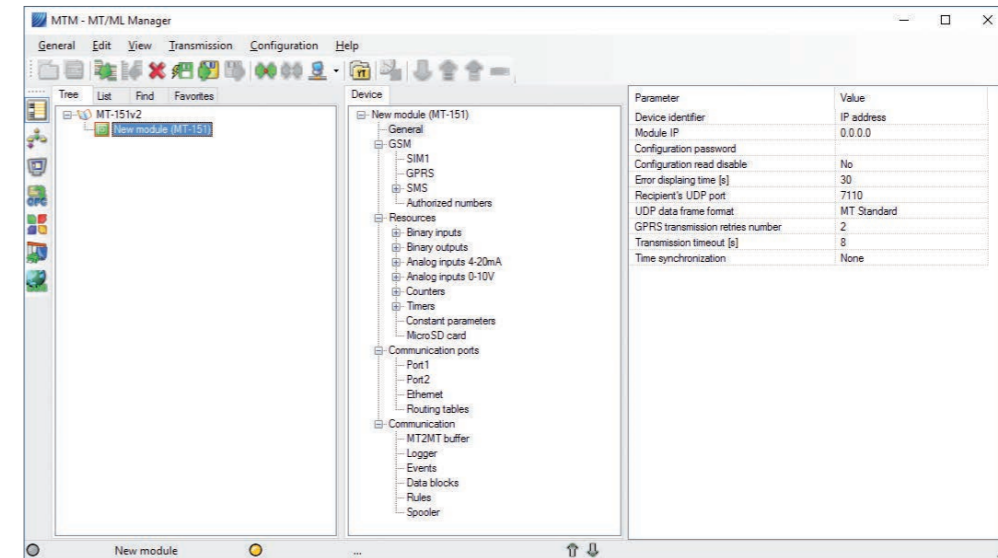
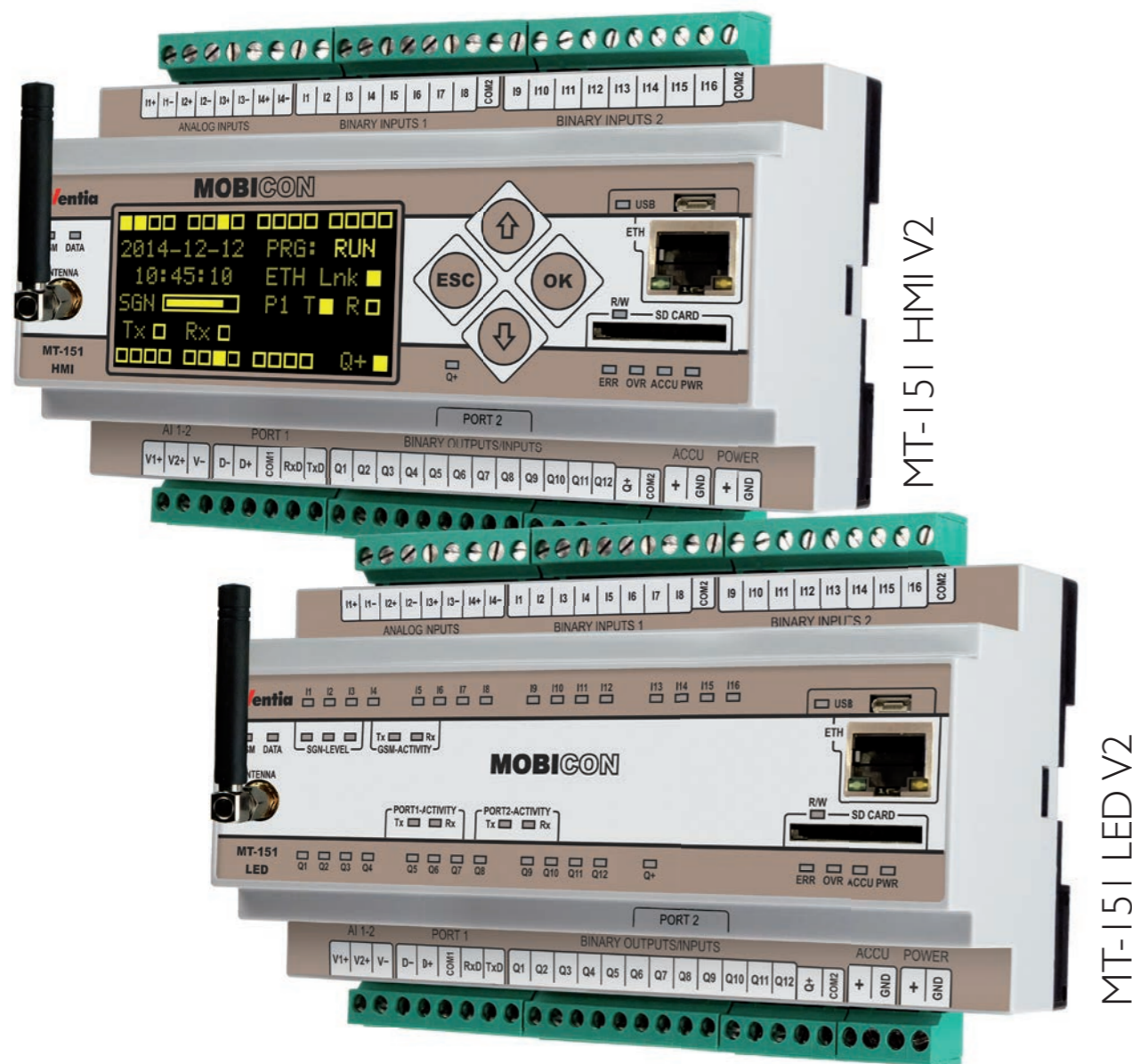
The function of restoring factory settings of the device is also available from the menu screen.

Special features:

- Integrated 2G/3G modem
- Dual-SIM technology
- 10 PT1000 inputs, including 2 configurable PT1000 / 4–20mA inputs
- 12 binary, configurable inputs/outputs (with galvanic isolation)
- 10Base-T/100Base-TX Ethernet port
- RS-232/485 serial port for external devices (with galvanic isolation)
- 1-Wire interface
- M-Bus interface (up to 16 slave devices)
- Dedicated RS-232 interface for communication with the IOT-RG-01 data hub module
- OLED graphic display (128x64 resolution)
- Diagnostic LEDs
- Backup battery power input (built-in control and charging system)
- Programmable PLC
- Data recorder (1 s time resolution) capable to recording on the SD card
- Support for standard communication protocols (Modbus RTU, Modbus TCP, M-BUS)
- Remote configuration, programming, diagnostics, and updating of the firmware over the GPRS network
- User-friendly free configuration (MT Manager) and communication (MT Data Provider) software
- 3-year warranty

The MT-156 HMI telemetry controller, like the other units of the professional MOBICON family, is covered by a 3-year manufacturer's warranty.

The new hardware version of the **MOBICON** series telemetry controllers



Six years have passed since the development of the professional MOBICON telemetry controllers family (solution awarded with the title of Product of the Year 2012 by Control Engineering Polska magazine). Progress in modems, processors and electronic components prompted us to develop a new hardware version of this family marked as V2 (MT-151 LED V2, MT-151 HMI V2). Significant changes introduced in the new version:

- Increasing the frequency range of counted pulses for inputs I1 – I4 from 250 Hz to 2 kHz.
- Abandoning the negative logic handling for binary inputs
- The connection of binary reference signals (COM2, COM3, COM4) into one (COM2). It is necessary to connect the power supply also to the terminals Q+ and COM2 (+ and - respectively).
- 3G modem replaced the previously used 2G modem – this has improved the responsivity and speed of packet transmission
- The processor has been changed to a version equipped with more RAM and FLASH memory resources
- The Ethernet port has been moved to the front panel
- LNK and ACT diodes are now integrated with the Ethernet port
- The USB B port has been replaced by the much more popular micro USB port
- The small microSD card slot has been replaced with the SD card version – it is much easier to operate a larger SD card in the device. It is also cheaper.
- The GPRS diode has been renamed to DATA due to the addition of 3G support
- All module status LEDs (ERR, OVR, ACCU, PWR) have been gathered in one place, under the SD card slot
- The GSM diode has received new functions – its color indicates the module status:
 - » Diode off – modem inactive, no errors
 - » Green diode – modem is logged into the 2G network
 - » Blue diode – modem logged into the 3G network
 - » Red diode – module error (ERR diode status copy)
- Changing the organization of SIM slots – changed their position by 90°

The above changes increase the technical capabilities of the MOBICON series and make it easier to use in typical applications. The introduction of a new version for sale does not mean the end of support for the previous hardware version – new versions of the firmware will be released, with improvements and fixes of errors noticed, also for the previous version of the hardware.

The new firmware versions of the MOBICON family provide some new features and capabilities. Support for the standard IEC 60870-5-104 protocol and support for the Grundfos GENibus protocol have been added. Communication capabilities have been enriched with the ability to send email notifications using the SMTP protocol (without SSL/TLS). E-mail messages can, just like currently used SMS messages, be enriched with dynamic content, depending on the values saved or read by the module, e.g. pump status (operation, standby, failure) or water-level measurement. Such content is asked using SNCS language commands – just like in the case of HMI display or SMS messages. The option of routing Modbus TCP frames from the GPRS/3G network to the Ethernet port has also been added, as well as serial ports with automatic translation into the Modbus RTU protocol and vice versa. The option of routing frames of the Standard MT protocol (the standard protocol for exchanging data of MT modules) has been preserved.

The scope of applications of the MOBICON series telemetry controllers will constantly be expanded by adding support for new communication protocols and extending the functionality.

AGREUS

Agriculture 4.0, or IIoT in agricultural practice

The industry digitization initiative, called Industry 4.0, is already well-established in the minds of those interested in the development of modern entrepreneurship. Despite the fact that agriculture is rarely treated equally with other industrial areas, in fact in the modern agricultural activity all the rules for running a business like in other branches of the economy apply.

The decision processes are carried out in the same way, or they should be, guaranteeing the best results at the lowest costs and involved means. The effects of good or bad decisions are also verified in the same way. To make accurate business decisions, reliable information is necessary, and these can only be obtained by trustworthy data. This leads us to the issue of obtaining data in production processes, including agriculture.

If we look at the situation of obtaining data in various branches of industry, we can notice that it is strongly dependent on the level of applied automation, and this is not optimistic for agricultural producers. The lack of highly automated processes and the relatively low technical culture of the machines and devices used do not give a chance to massively collect multi-source data, which are the basis for effective processing into useful information. Of course, more and more is being said about SmartFarming, agriculture that benefits from the most modern techniques, combining agrotechnical work with information controlling the operation of machines by the cultivation needs to be established by advanced algorithms. Technologies that we can conventionally call „Agriculture 4.0“, however, concern in the vast majority of large-area crops of cereals and other plants that form the basis for feeding the ever-increasing population of the Earth's. In a different situation, there are branches of agriculture in which production takes place on fruit or vegetable plantations. In this case, metering does not exist, and the methods used to support agrotechnical activities are based on many years of experience of the persons conducting operations and on the meteorological data published for particular crop regions. Due to the very large diversity of terrain and soil conditions of cultivated areas, it is

not possible to obtain a proper correlation between the published data and the actual situation at the place of cultivation. Decisions taken on this basis may be subject to a large error, resulting in crop losses or significant expenditure on unnecessary agrotechnical activities.

However, there is a chance that this situation will change. There are technical measures to precisely determine the climate and soil situation in large areas of crops. This is possible due to the emergence of technologies in the field of Industrial Internet of Things (IIoT), allowing for long-term use of wireless, distributed, battery-operated or solar-powered sensors. Distributed sensors to measure soil or climate parameters can become a source of data for systems supporting agrotechnical decisions in areas covered by metering. The AGREUS system is to serve this purpose.

The AGREUS system is the result of the combination of Inventia experience in the field of wireless telemetry as well as the knowledge and skills we gain by working with the Irrigation Plant of the Agroengineering Department of the Institute of Horticulture in Skierniewice, headed by prof. Waldemar Treder. The cooperation aims to create a new quality of supporting decisions in irrigation and plant protection. Ultimately, the AGREUS system will include many types of environmental and technical sensors. Data from these sensors will be sent to the integrating portal and will be transformed to information supporting decision makers. The monitoring will cover the temperature and humidity of the air and soil, i.e. the basic parameters necessary to determine the needs of plants for water in the irrigation process. Also, data on rainfall, wind speed, and insolation will be monitored, or obtained from third sources, which will increase the precision of agrotechnical activities.

Historically, the AGREUS system appeared as a project solving problems with proper irrigation of both agricultural crops and home gardens. Therefore, the measurements of soil moisture and weather conditions as well as irrigation control became the basis. By assumption, the system should solve many of the inconveniences of current irrigation control systems, such as the need to run valve control cables and the poor possibilities of creating irrigation patterns, usually boiling down to sequential run of individual sections. Few systems allow for correlation of irrigation with weather and rainfall, and so far it is difficult to find a system that allows creating flexible schedules and automatically referring to measured soil moisture or data on the level of recent or forecasted rainfall. Of course, the situation on the agricultural solutions market is dynamic, but it seems that the available so-called Smart systems are not able to meet all users' expectations. It is even more important that the chosen information acquisition technology allows extending the application of the AGREUS system to initially unplanned possibilities.

„The concept of distributed soil, climate and irrigation control system proposed by Inventia gives a unique possibility of using sensors in quantities and places suited to the needs of the recipient – the client will be able to start the adventure with the system from one sensor and will be able to expand the system practically without any restrictions, and the data will be stored in the cloud with easy access from your computer or your smartphone. The combination of sensors in the radio network frees the user from the cumbersome wiring”

– indicates prof. Waldemar Treder.

The heart of the AGREUS system is the base station transmitting data from/to distributed terminals, that is creating a network of sensors and execution modules. The transmission takes place using a long-range wireless radio network – LoRa. This technology, depending on the terrain conditions, allows covering with its operation a large area of crops with low energy consumption, which is a critical parameter for battery-powered devices. Also, the AGREUS base station connects to the Internet either using the Wi-Fi of the existing local network or independently via GSM (3G, LTE) or optionally via Ethernet cable connection. The Internet connection allows you to send the collected data to the AGREUS Portal operating in the cloud. Transmitted data is collected on individual accounts of System users, becoming the basis for ongoing analyzes and generated reports.

The AGREUS portal enables managing both connected terminals and users, allowing the creation of personalized user profiles within the created account with different levels of access rights. Automated adding additional terminals using NFC and the flexibility of configuration of information screens that can combine current and historical data, facilitates the use of information collected in the field. It is not the purpose of this article to accurately describe the configuration options and functionality of the solution being prepared, but it should be said that the user will have access to various forms of information sharing, including simple numerical data presentation, current and historical graphs and presentation of data on the basis of an interactive map or customized graphics. Such diversity of possibilities will surely meet the users' acceptance allowing to tailor the presentation of information to individual needs.

The basic form of using the AGREUS portal will be accessed from mobile devices, which will certainly facilitate the use of the system. Data for mobile devices will be downloaded from the portal in real time, making the information available the basis for making decisions. Portal dashboards, alarms, and reports received via e-mail or SMS are additional factors that allow the AGREUS portal to be treated as an irreplaceable source of data about cultivated crops.

In addition to access through the cloud, local access will also be possible, allowing the dispatching and viewing of irrigation orders as well as the presentation of the current and, to a limited extent, historical collected climate parameters. By default, local access will be less flexible than that offered on the portal, which is the result of the limited computing resources of the base station.

As the first elements of the AGREUS system, despite the integrating base station AGB 2000, the modules will be

AM-110

A digital input module that allows the connection of a pressure switch and a water meter to assess the correctness of the irrigation process.

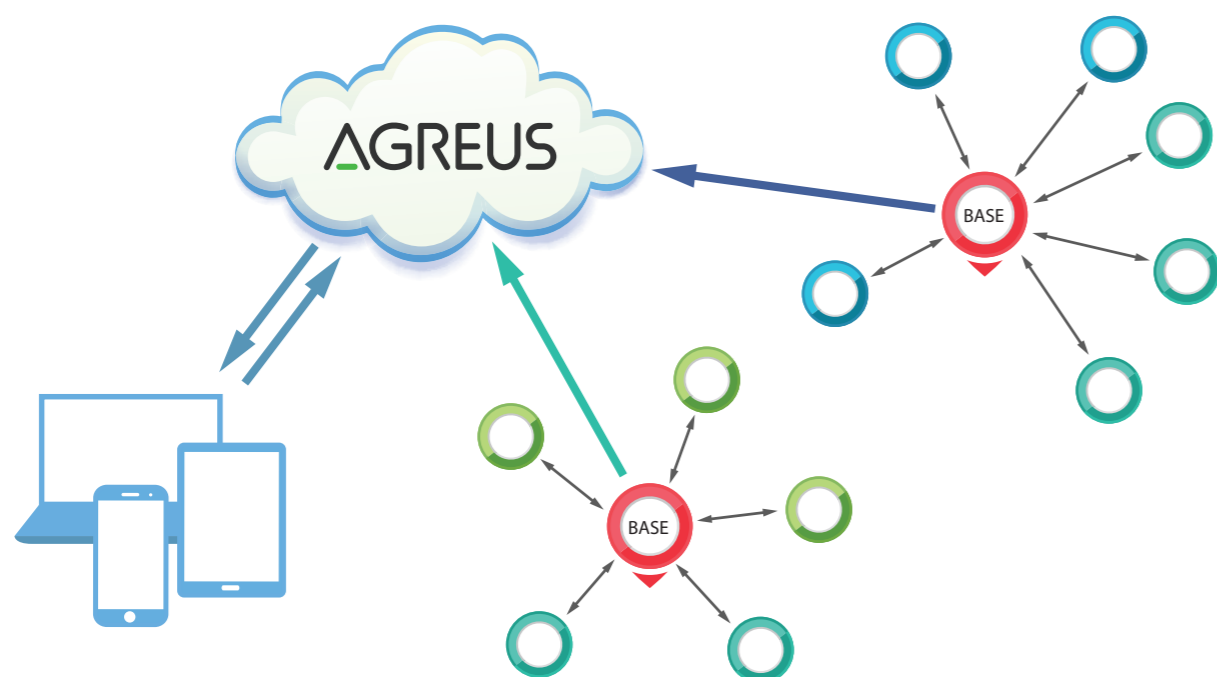
AM-411

The execution module allows independent control of 4 valves of the irrigation system activated by 24 VAC.

Also the following modules will be available:

AM-200

Temperature and humidity measurement module in greenhouses, cold stores or mushroom cellars, allowing to create a system for monitoring the greenhouse conditions, independent from the control of environmental parameters.



available to implement the original idea, i.e. intelligent irrigation control, based on soil moisture measurements and weather parameters. They will be:

AM-100

The profile moisture, temperature, and soil salinity sensor allowing to measure parameters on 1, 2 or 3 levels, to precisely determine the method and level of irrigation necessary to maintain the optimal condition of crops. The sensor will also allow monitoring the air temperature on the surface, providing information to support warning against frost.

AM-401

The 230 VAC / 10 A relay output module allows controlling the operation of various mains-powered devices, including lighting.

AM-421

The executive module allows independent control of 4 irrigation system valves using 9 VDC. The module is battery-powered. The solution is used when it is not possible to supply valves from a 24 VAC voltage source.



Our plans include the creation of many other remote sensors and execution modules allowing not only for climate monitoring and irrigation control but also for the physical protection of equipment and warning against undesirable phenomena. By definition, the system is prepared for sending data of various types, which is greatly assisted by the MQTT protocol used for transmission purposes, the emerging standard of the Internet of Things. The use of MQTT is not only to ensure the privacy, integrity, and security of data sent by native elements of the AGREUS System but also to make possible the products from other manufacturers to be integrated with the AGREUS portal using this protocol. This means opening to unlimited possibilities of extending the functionality of the AGREUS system, whose future applications will be limited only by the imagination.

When developing the project, we use EU subsidies under the program Measure RPO WM 1.2 Research and development activities of enterprises, project number RPMA.01.02.00-14-5663 / 16-00: "Development of an innovative system for measuring distributed climate and soil parameters as a tool for optimization of irrigation, plant protection, and agrotechnical works"





DataPortal.online

„One picture is worth more than 1000 words” – is still an up-to-date Chinese proverb which in the current reality explains how to transfer information to the recipient effectively and simple. The primaeval man already knew that the painting on the wall of the cave would provide a summary of the events that had happened to him. Nowadays, in the electronic media era, a graphic image also more quickly speaks to us than text, which carries detailed and additional information. This is confirmed by the huge popularity of websites, where users share photos or videos with each other, and only after that are comments. Similarly, it happens with numbers. The graph is easier to analyze than a table with many data. Of course, it all depends on the type of analysis, and without a table, there would be no graph. One thing is certain, imaging the collected data or measurements and the appropriate presentation makes it much easier to analyze them. The first look at the graphic displayed on the screen immediately characterizes the present or past situation. In the next step, we are interested in details. Such a concept of observation occurs in all monitoring or control systems of industrial processes. The observer must immediately get information, e.g. about an alarm event or general installation status. This task is to be carried out by a new internet platform, complementing the telemetria.pl project. **DataPortal** collects data from telemetry modules, performs the requested analysis and provides results in

the form of animated graphic images that will provide the observer expected information in the expected form. We invite you to read the following thousand words describing the details of your own... Telemetry Cloud.

Own Telemetry Cloud

DataPortal is, to simplify, a SCADA system accessible from an internet browser. It is a WEB server, displaying animated visualization in the browser. You log on to the appropriate page, and animated drawings appear on our computer or phone, allowing you to observe the current state of the monitored object or process. You can ask where is the cutting-edge technology in this? We start the server, we build a data-powered website, and it is ready. This is what the final effect should look like. It should be finally a tailored visualization on a website that is available wherever we have access to the network. We start the browser, log in and get the expected screens that provide the necessary information after the first look. The next step is a detailed analysis of information and action against possible irregularities. **DataPortal** is a place where exactly such a tailor-made system can be created. We do not need to buy servers or licenses, install software or develop a program in PHP, JavaScript or HTML.

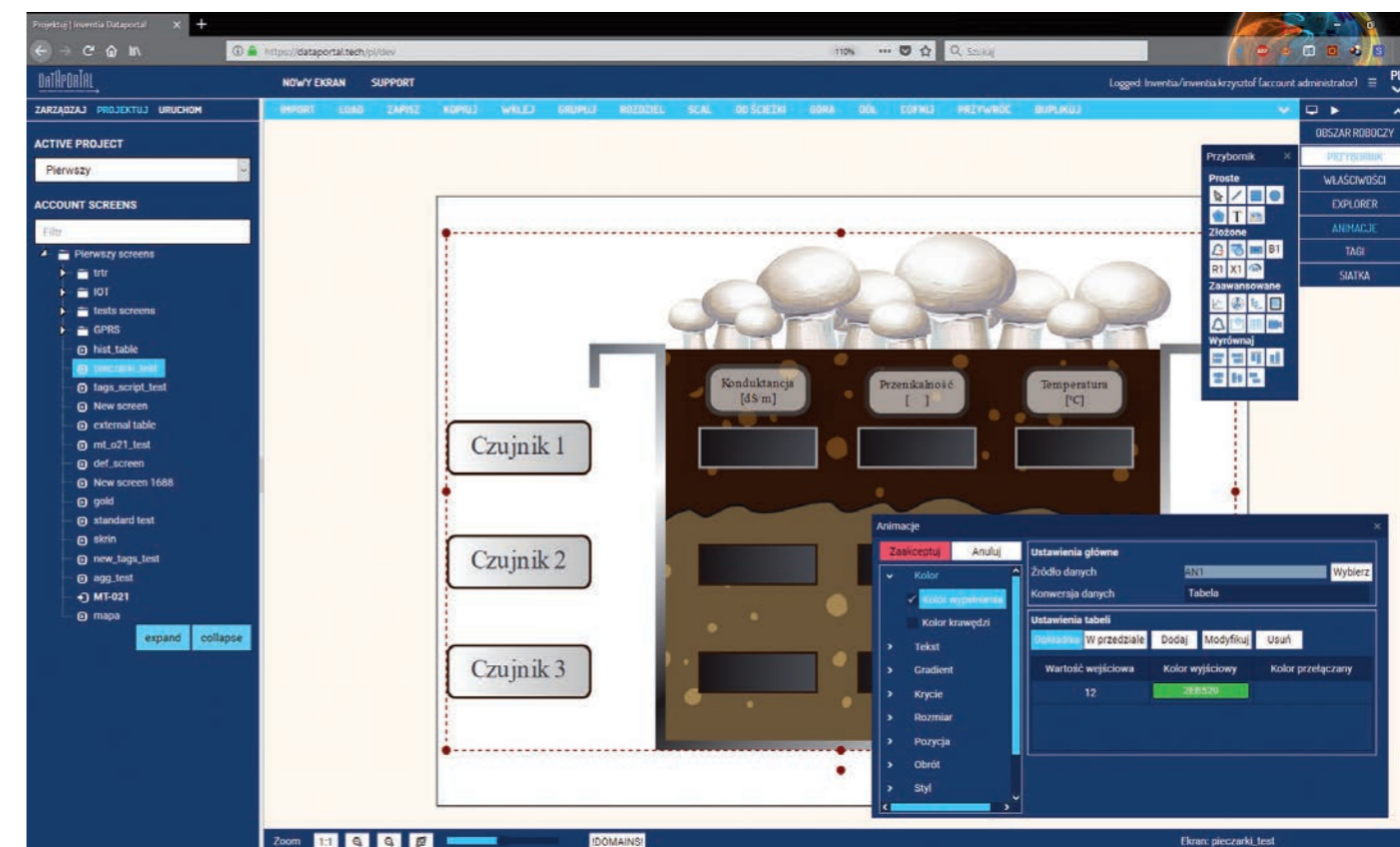
The platform provides ready-made tools. Users of MT telemetry modules can use the portal for their implementations without the need for using other visualization systems. **DataPortal** is fully compatible with the project telemetria.pl. It supports all telemetry modules currently available in the Inventia offer. The service is embedded in „Cloud”, where after logging in you have access to management, design, and animation of created drawings in RUN mode. You start the adventure with **DataPortal** by creating a user profile.

User Profile

To create a user profile, first of all, a telemetry module is required. During the registration of the device, you create your account and the user with the administrative profile. The administrator account has access to all available functions. It can create additional profiles for users who want to access content or contribute to it. New profiles do not necessarily have full access to content. We have predicted several access levels defined in the system and available to administrators

Devices or data sources

The device added to **DataPortal** requires a proper network configuration to correctly communicate with the „Cloud”. A correctly configured module is recognized on the base of the transmitted identifier. Data sent to **DataPortal** is received in an unprocessed form, i.e. we know what the device is sending, but we still do not know what final form we will adopt. **Data Source** is required to interpret received data in **DataPortal**. It is a complement to a physical device, an intermediary that provides information to **DataPortal**, marking it with its tag. The data source is created when adding the device to the „Clouds” resources. The device and data source become connected. Thanks to such a procedure, the structure of measurement data in **DataPortal** is separated from the hardware layer. At any time, the account Administrator can disconnect the device from the **Data Source** and use the hardware for other purposes. The source still exists and can be powered by data from another device. The data supply is directly related to the data transmission.



to grant rights with one click. Such role is, for example, the Observer profile. It allows only logging into the project or projects with the created visualization indicated by the administrator. The content of the account can be expanded by adding additional devices, SIM cards, and additional services. Administrator permissions allow you to manage the added resources within your account. Only the data source is missing to receive measurement data from the added devices.

Data transmission

DataPortal is directly connected to the telemetria.pl project. It is the easiest and fastest way to communicate in a secure, closed network. The „Cloud” itself provides tools for managing your SIM cards. Currently, it is possible to assign available cards to your devices. You can also check the remaining period of card activity and estimated data usage. You can choose from three operators who are a partner

of the telemetria.pl project. We have also predicted other methods of providing data that are not yet available in the interface. They can be included on special request. Meanwhile, when the SIM card is already plugged in the device, the logged module transmits data, and you have a connection card-device-source in the Cloud, it is time to check if and what data you receive.

Raw data (RAW)

It is time to choose the resources you want to monitor. Telemetry modules send events, contents of the recorder or answer queries. In any case, they are numbered registers or bits. DataPortal receives data unprocessed by default. Data received from an event or recorder is presented in decimal or binary format. It is up to the user

registers it contains, or maybe it is a plain text. Depending on the type chosen, we can specify additional options, e.g. specify scaling conditions to process the received values according to a specific pattern. The alarm settings are also indirectly associated with the TAG type. DataPortal for indicated TAGs can automatically detect alarm situations, collect them and display even when a given status no longer exists. Alarms can be presented on dedicated controls described later.

Returning to TAGs, we currently distinguish five types:

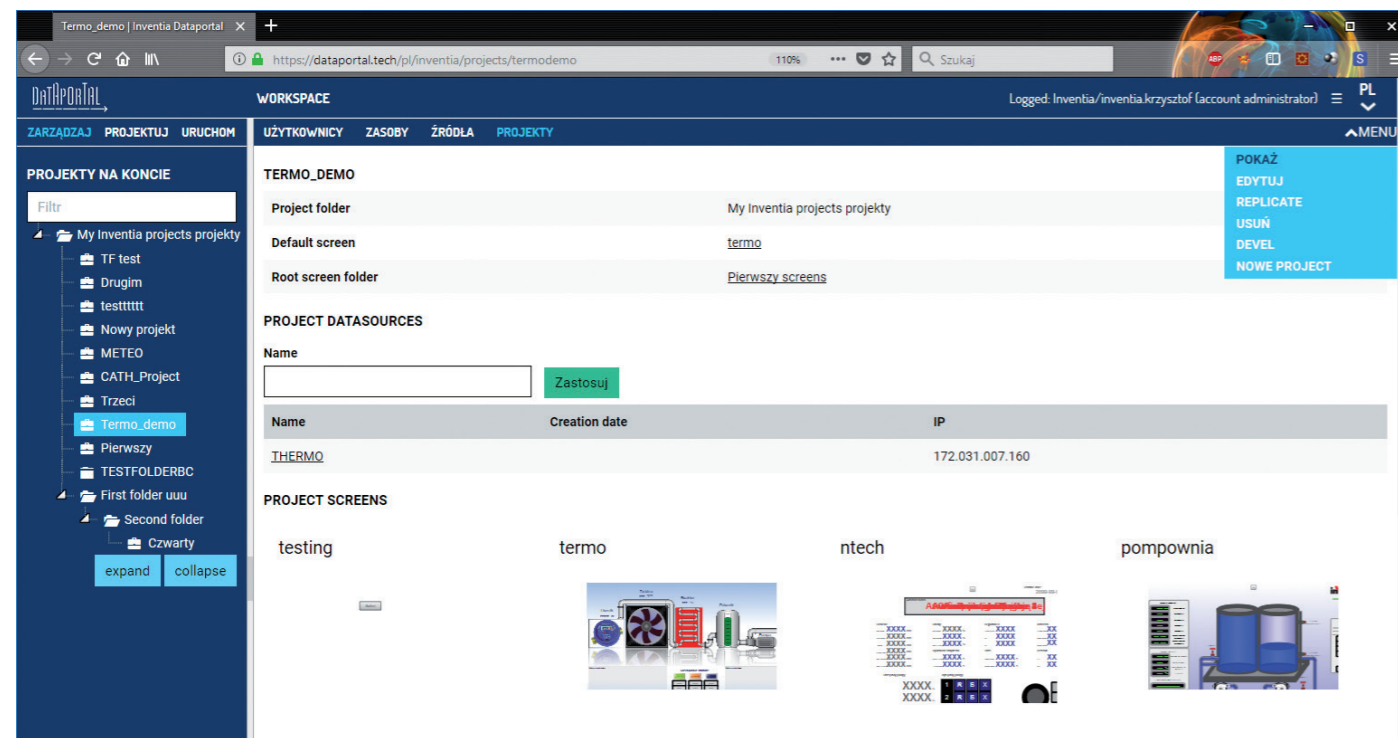
REAL – data coming from physical devices are saved in history, their current value is available on an ongoing basis.

VIRTUAL – unrelated to devices, store data entered from the visualization level, are saved in history.

exists temporarily in „Cloud“ and is named Block Date. The definition comes down to determining what kind of registers we want to query, with what period. DataPortal polls the indicated source with a relevant query receives a response from the source associated with the device performs the requested conversions and provides the resultant value according to the definition of the TAG. The values are added to the history and transmitted as current to the Project related to the TAG.

Projects, Screens

The project includes Users and Data Sources with TAGs. A project is a set determining the membership of individual elements of the visualization system. It also contains, and first of all, animated screens, which in addition to graphics have a direct connection to the current and historical values of specific TAGs. The project combines all the elements enabling the use of received information on animated drawings, diagrams or detailed tables. The project can be assigned to specific users and thus becomes available to them. One of the screens in the project can be selected as a startup. In this way, we get a user profile, which after logging in starts a properly prepared screen from which you can navigate through the entire created visualization.



to decide which values are to be archived and in what form. Some may require rescaling, others may represent a real value only after the appropriate „assembly“ (e.g., a floating point variable covers a few registers), others are to be in binary form, and we receive them in decimal form. The data received by DataPortal in the RAW format gives a preview of what the module sends, whether the received data is expected, or perhaps there is too little or too many data. Having a preview of the raw data, we are close to the values calculated by the specified measurement variable format, i.e. a single TAG.

TAGs and Data blocks

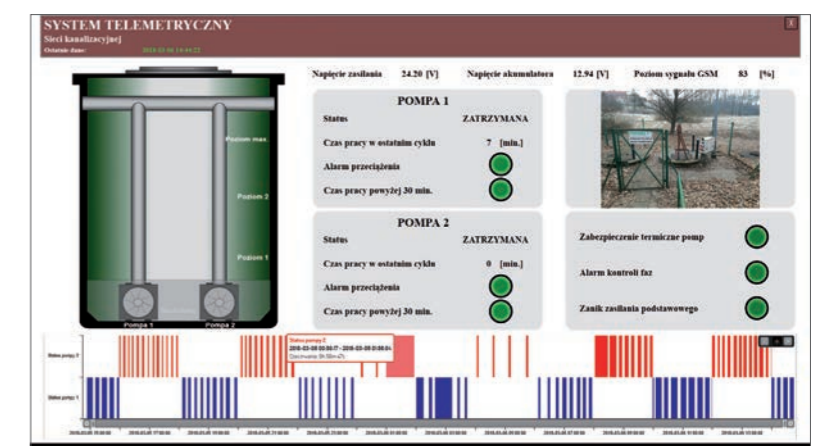
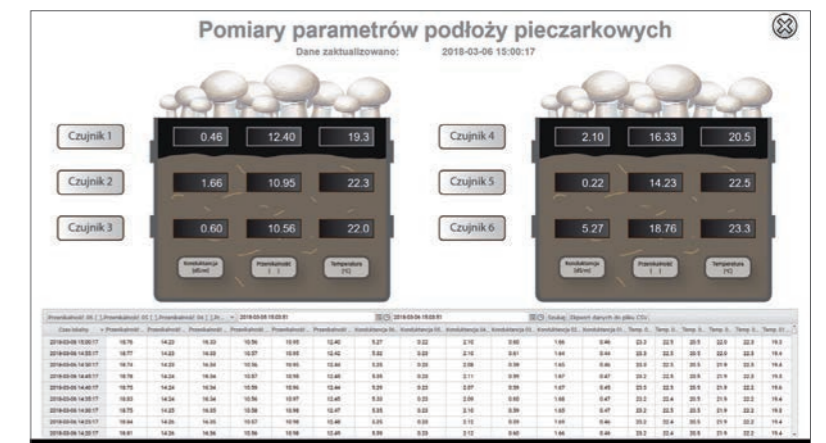
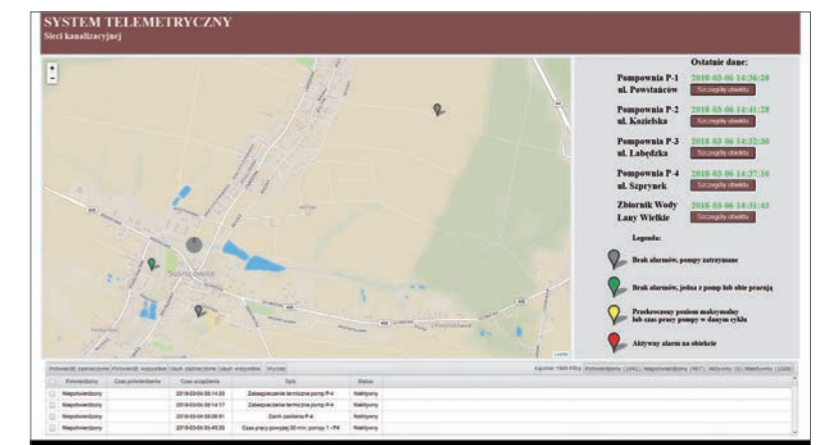
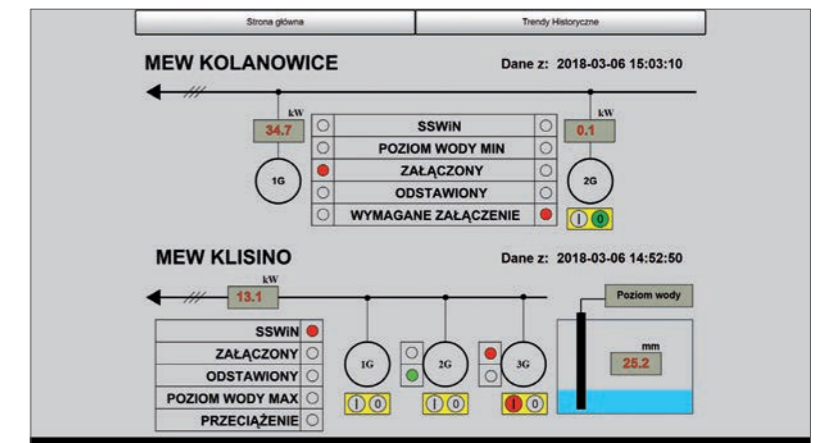
This is what we called a single variable that introduces the current value into the system and is recorded in history. The TAG configuration allows you to specify its type, i.e. whether the value should be an integer with the sign, maybe it is a floating point variable, how many

PROCESSED – recalculated data whose value is the result of mathematical operations performed, where the arguments are other Real or Virtual TAGs.

LOCAL – unrelated to devices, they store temporary data, derived from the processing of real or virtual TAGs, but only when we are looking at drawings; the current value is not archived.

PLACEHOLDER – indicators for other TAGs, dynamically changed when running twin visualizations displaying data from many objects with the same structure in the same figure.

The correct interpretation of incoming data from devices is possible only when the TAGs have the correct settings. DataPortal provides a preview of the current processing results, and when it is necessary, adjustments and re-verification are possible. TAG values are processed from regular event-sent data from internal device recorders as well as from classical time-repeated query. Repeat query

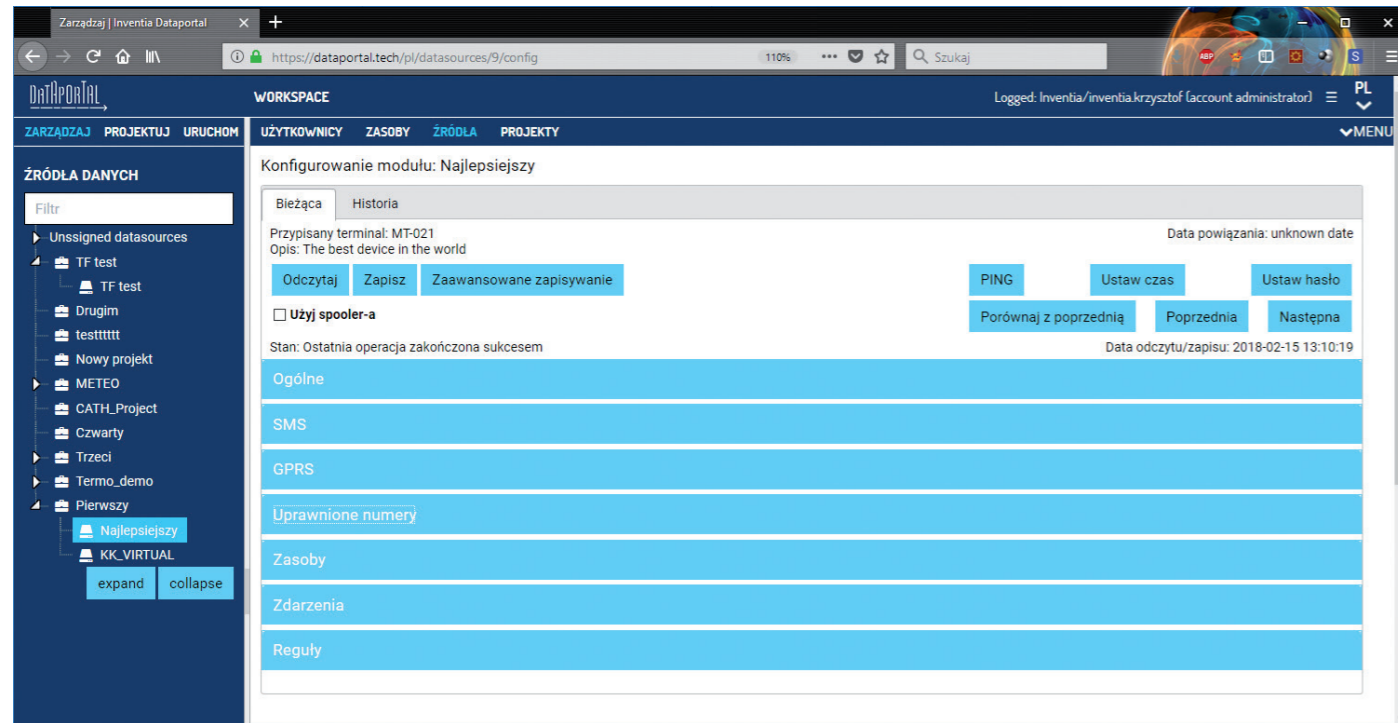


Creating in DataPortal Designer

After switching to the DataPortal designing mode, it launches a tool that allows drawing screens that will be displayed as animated to the logging users. The Designer is an editor that allows you to create vector graphics of different complexity. Also, it is a tool for reviving them based on data from previously prepared TAGs. The developer has a workspace for creating drawings that will become synoptic screens. All basic options such as save, copy, group, etc. are available directly from the basic menu. The functions for creating visualizations are available on dedicated panels, whose visibility and position on the screen can be controlled depending on preferences. Once launched, Designer presents a system demo screen or an empty workspace, depending on the choice. We start creating the first or next screens in the Project.

Drawing Screens

We start by determining the size of the drawing and its proportions in the WORKSPACE panel. At this point, we also have the option of selecting the UI (user interface) style for displaying preset controls (their description is in the following text) and selecting the background of the area in the form of any drawing or solid color. Graphic objects and controls are available after invoking the TOOLBOX panel. Simple functions such as draw-



ing a line, a circle, a rectangle or any path give you an introduction to creating any graphic. An essential element is also the option of inserting text and external graphics. The toolbox also provides complex elements, such as an alarm counter, various buttons, and an animated indicator. After selection, these elements require adjusting their appearance or operation to match the expectations by modifying their properties available on the panel with the same name. The toolbox also provides advanced elements that additionally have their windows with settings available after double-clicking the added control in the workspace. On the other hand, advanced elements are nothing but ready-made controls, for example, a chart which external appearance depends on the chosen UI style.

Graphs and Tables

A single control can take the form of one of four available graph types: linear, columnar, point (XY) and Gantt. Regardless of the type selected, the user influences the control's appearance and its behavior by changing the settings on the PROPERTIES panel. For convenience, we have divided the settings into groups: General, Axes, Style. Each of them contains parameters, the change of which allows you to adjust the control to your own needs. For correct operation, the selected type should be equipped with pens that will present values from the indicated TAGs. Each pen can be edited independently. The control displays the current trends in the automatic refresh mode. In the properties, you can choose to work with archive data. In historical mode, the trend display control is done manually by the user. Data presentation is static according to given time criteria. The change in the approximation is manually triggered, thus completing the missing measurements. The Graph control is complemented by a Table that also displays current or historical data for connected TAGs. The table is independent but can be paired with the Graph

control. Such configured Table control is automatically filled in with data currently displayed in the Graph. The table allows you to export your content to a local computer disk with one click. The downloaded data can be used for further analysis in other programs. The table also has simple functions for calculating mean values, totals, and differences for displayed data. There is no limit to adding multiple graphs or tables in one project. A specific type of table control is Alarm Summary.

Alarm handling

A summary list of alarms is used to display and manage alarms in the project. The control automatically displays alarms according to the configuration of the related TAGs. Alarms can be confirmed, deleted and commented with your own text. When creating a screen in the settings of the alarm summary, you can delete or add columns and auxiliary counters displaying the total number of states in which individual alarms are located. The summary also allows you to play audio signals when an alarm situation occurs. The complementary element is the alarm counter control. It is foreseen for inserting into drawings, where it is not envisaged to place a table. Thanks to this, the user will always be informed about the occurrence of a new alarm regardless of the currently displayed screen. The alarm counter also plays back sound signals.

Let's show it on the Map

The MAP control displays in the RUN mode an active map with marked locations of monitored objects. During the configuration of the control, you can set the initial view of the map, the start position, and apply and personalize the location markers. The color of the markers is animated and describes the current situation of the

object. The marker can simultaneously be a shortcut to detailed data. The map is ideal as an element of the start screen in distributed monitoring systems, where the location of objects is scattered in the field. Map configuration also provides the option of placing markers of moving objects. The Map control and other elements of the toolbox have some configuration parameters to be modified on their PROPERTIES panel. Like markers, the controls can be animated in the RUN mode using properties settings, depending on the imposed conditions.

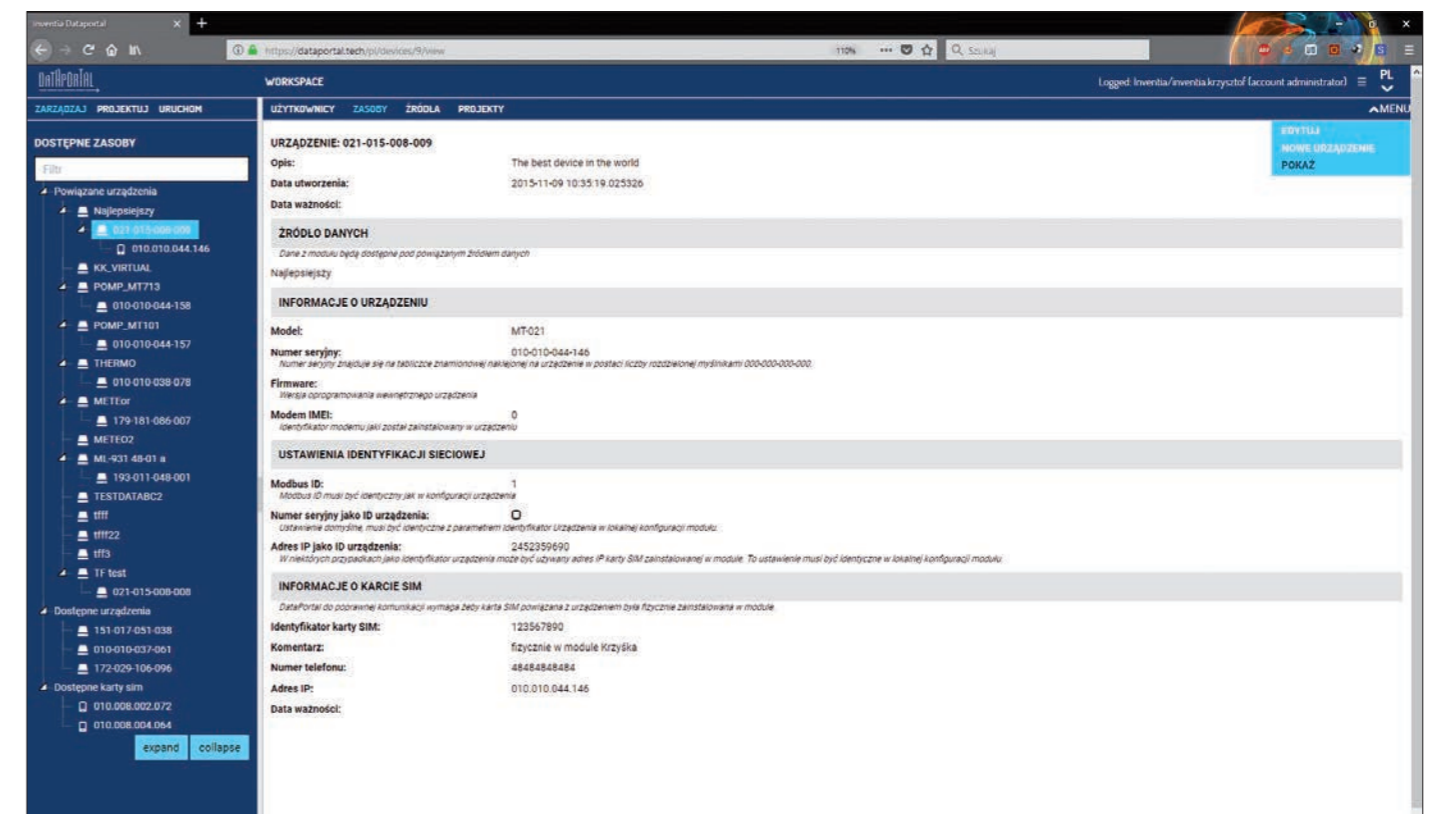
Animations

Following animations are at developer disposal: color and gradient, text, transparency, sizes, style for the objects used, position in the work area, object rotation and percent fill. Any combination of using the available options is possible. It all depends on the invention of the person creating the screens. You can create any number of screens in the project. Navigating between them, switching screens or calling a pop-up window with another screen is also treated as the animation. DataPortal provides ready-made scripts that allow

RUN visualize

When the visualization project is completed, the data from the objects are flowing down, and the animated elements are displayed correctly, it is time to move to the RUN mode. This is the final form that will be available to the user with a normal profile, e.g. an observer. After logging in, DataPortal will immediately start the project in the animation mode and present the screen selected in the project as a startup. Navigating the visualization will be consistent with the will of its developer. However, the user profile may limit certain privileges, e.g. the ability to control or acknowledge alarms. Each user, regardless of the profile, can set the RUN mode as start mode and immediately after logging in, get direct access to the live visualization.

This is how the visualization in DataPortal looks like in a nutshell. However, this is not all. We hide more possibilities in the cloud. They are not directly related to visualization, but they complement the service's potential.



you to create visualizations of many levels. Among them are also ready-made scripts for updating data on demand or for sending control commands to be delivered to remote devices. When designing, you can test your visualization at any time by putting it in motion. Such an instant preview gives the developer the answer whether the expected effect he wants has been achieved. The animated mode is a separate layer of DataPortal. During design, you use it only for testing and diagnostic purposes.

WebMTC

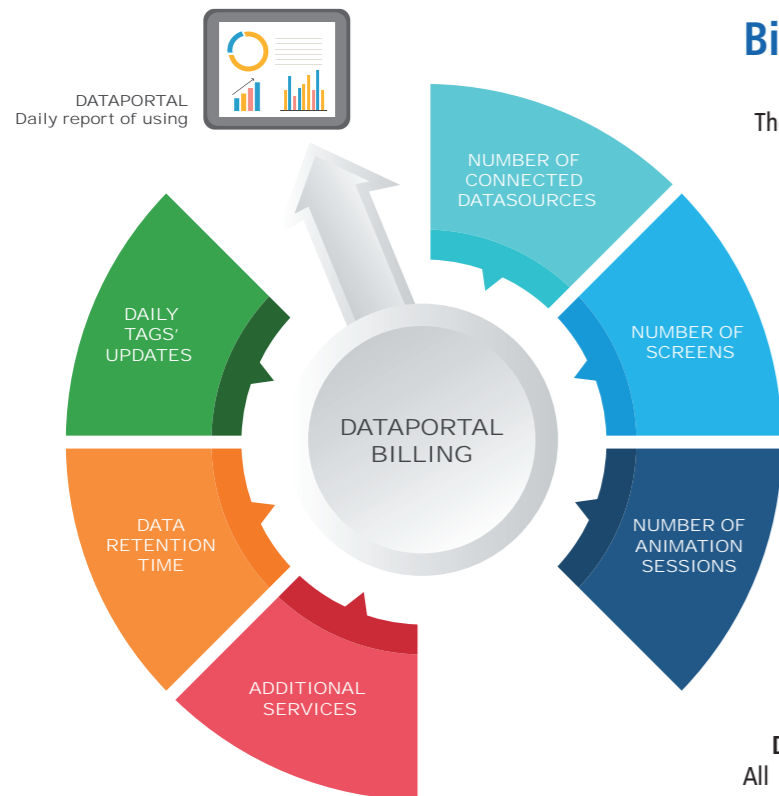
DataPortal Cloud is not just a visualization. We have also embedded in it the tools designed to change the configuration of connected devices. The configuration method and its form were taken from the MTC program, which we provide in the form of a local, quick configurator installed directly on the computer. The network version of webMTC currently embedded in DataPortal allows only the configu-

ration without the possibility of programming (at the moment). In the network version, you can modify almost all parameters that are available in the modules, bypassing those responsible for logging the device to the GSM network.

We provide full read and write of configuration, the ability to synchronize time, and the access to devices with a password. We also support the operation of battery devices that have the function of reporting to the MT-Spoofer service, which is also implemented directly in DataPortal. The whole history is also completed by the configuration changes history, which was carried out using the Cloud level. Saved historical configuration images can be described, viewed and, if necessary, loaded into the currently connected device or used in the future to massive instant updating of multiple devices.

Data hosting in DataPortal

Maybe we do not need visualization; just Excel is enough or we have our data analysis or presentation software?



DataPortal is prepared to collect large amounts of frequent measurements. Data acquisition from devices is carried out in RAW mode and processed form as TAGs. Data can also be registered without the need to build a synoptic. We predicted a few ways of accessing archives collected by DataPortal. This option is designed specifically for the needs of customers who want to take advantages of telemetry but accustomed to their systems of visualization or programs.

Possible forms of data distribution to the customer:

DATA REFORWARD (ROUTER LESS) – a service data transfer from telemetric devices without the need to use the gateway or access router to telemetry.pl. DataPortal acts as a Router and becomes a telemetry gateway. You only configure data sources and local telemetry system, where you receive data via MT-Data Provider.

RARE EXPORT – collected data is available in the form of CSV, XML or JSON files according to the set time interval. Data is exported to the FTP server provided by the user. This method requires TAG configuration as well because the data in the files are fully processed.

OPC UA SERVER – DataPortal becomes an OPC server in UA architecture. Customers can connect to the server using a secure encrypted channel. The server provides data according to the configuration of data sources and connected TAGs.

Billing

The costs of using DataPortal depend on several factors described later in the text. The sum of each factor costs determines the daily load. In general, we have adopted a daily model for the settlement of costs, i.e. once a day the use of resources is reduced and the limit of available credit is reduced. The credit is expressed as the amount of virtual currency Vcoin. The resources of Vcoin can be supplemented directly from DataPortal. Depending on the visualization model that you chose, each project will generate different loads.

The elements affecting the daily invoice include:

SCREENS – we count the number of animated screens created. This is done once a day. The user, while adding screens, has a current preview of the current costs that will be charged to him at the end of the day, so unnecessary screens can be deleted and will not be included at the end of the day.

DATA SOURCES – counting data sources is done just like screens. All data sources are counted. There is no limit to the number of devices or SIM cards.

ACTIVE SESSIONS LAUNCHING – we count simultaneously run sessions of the RUN mode. However, the number of users created

within the account is not significant. The number of simultaneous sessions is counted per account (we also enable logging in from many places with the same login). We check the number of sessions online and display an appropriate message for the user who is trying to start the RUN mode above the available limit.

DATA ARCHIVING TIME – the duration of data storage is determined relative to the entire account and is counted in days. All TAGs have the same retention period regardless of the frequency of updates. Data that will go beyond the time limit you have bought is deleted. After extending the time limit, new data fill the increased space to the new threshold. After reducing the time limit at the end of the day, the data from outside the range is marked for deletion. The deletion of data takes place at the moment of calculating the daily invoice.

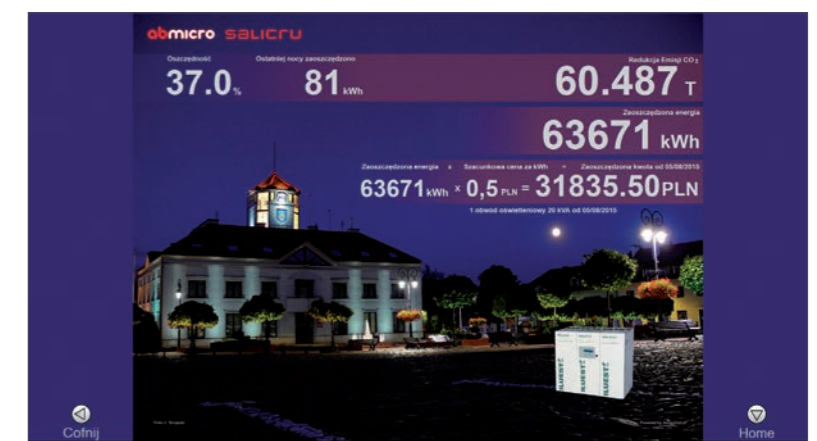
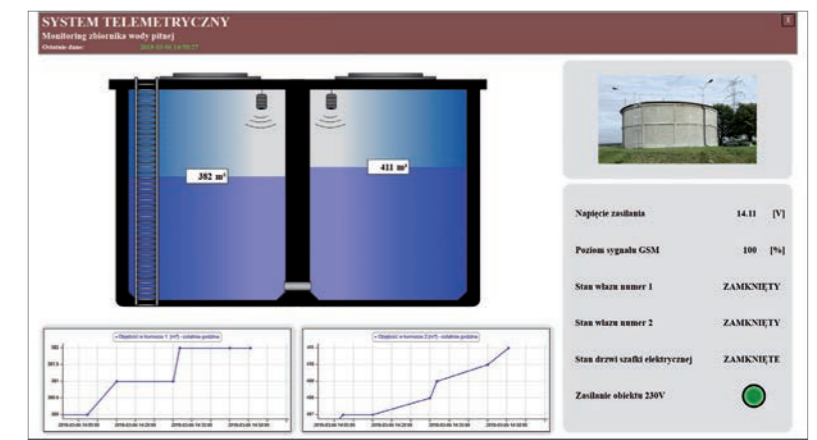
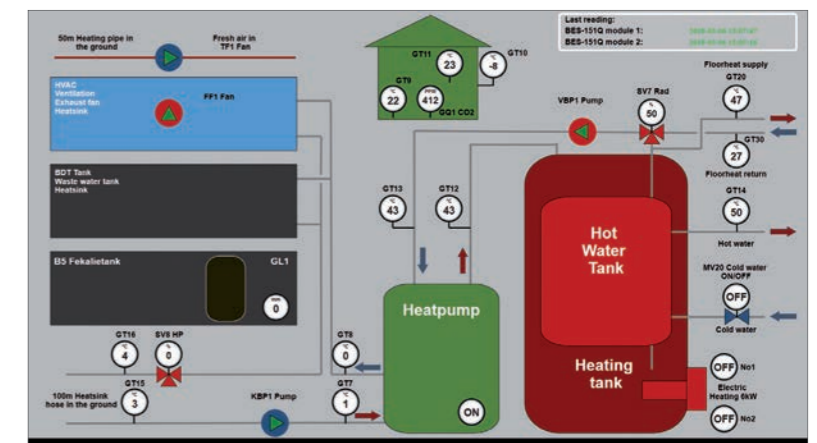
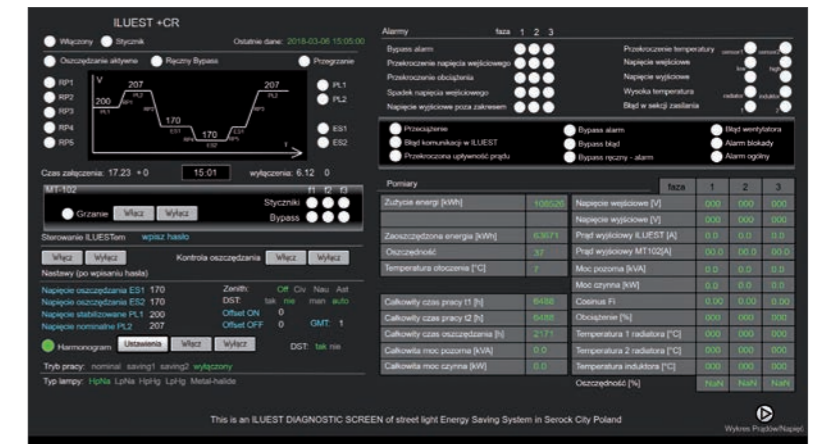
TAG VALUE UPDATE – we count daily updates of all TAGs created per account. The user sees on an ongoing basis how many updates he has and therefore he can see what is the cost is at the moment. We set a daily update limit, and its exceeding will remove additional parts of the virtual currency from the account at the end of the day. The number of TAG updates is a dynamic element and each day can be a different value depending on the device configuration.

ADDITIONAL SERVICES – at the moment we have three additional services associated with data transfer. Each of them is counted independently and added to the final daily cost. Thus, starting next instances of the OPC server increases the daily cost, such as handling the next FTP server to be connected to the DataPortal or the next IP address in the DATA REFORWARD service.

Our tests and calculations show that the estimated monthly cost of maintaining one data source, where we have about 9,000 data updates daily, displayed on three screens with simultaneous access for three users is about 3 EUR net.

We invite you to create friendly visualizations and use the full possibilities of telemetry in „Cloud” because Data should Work for us!

Let the data work for You!





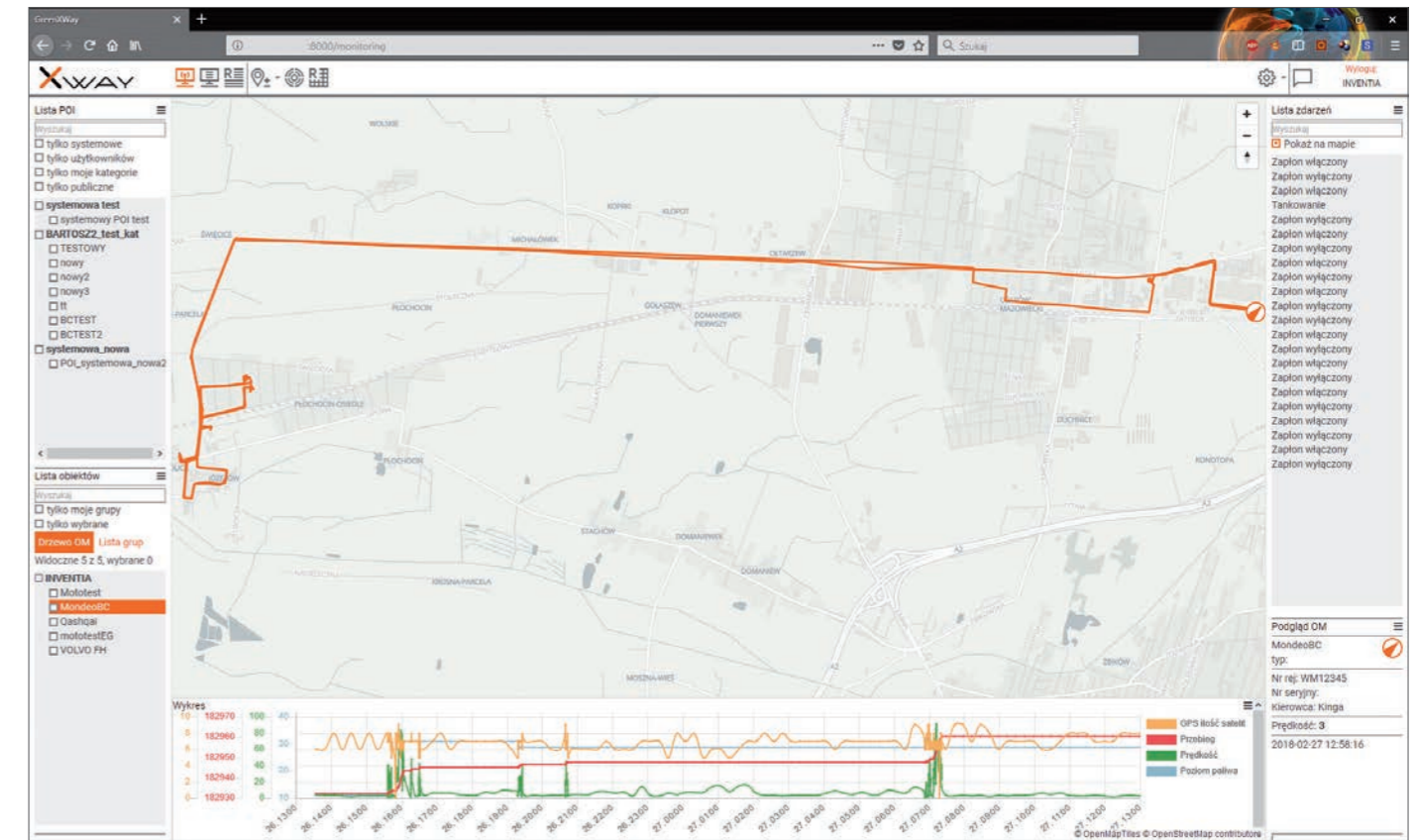
We are pleased to present the look and some of the features of the new version of the WEBXway location system that have already been implemented. All service components are manufactured and delivered exclusively by Inventia. So far, the basic tool was the XwayMap application designed for monitoring, viewing and analyzing data. Last year, we decided to transfer the application and the system architecture completely to the internet platform.

WEBXway is transparent and easy to use application consisting of several functional modules:

- **Map** – using the OpenStreetMaps maps – with the central map area for showing the track/tracks of vehicles and function panels on the left and right side of the screen. The area of the chart its located at the bottom, giving a unique opportunity to present on the graph many signals, both analog and digital.
- **Reports** – they are delivered in three formats: XLS, PDF, and preview.
- **Notifications and User's events generation** – this is another unique solution that allows the user to check the required coincidences between signals and events generated by telemetry terminals.
- **Reading of tachographs and driver cards.**

The last two modules are currently being tested by the development team.

On the occasion of modernization, we have designed some elements from scratch. The appearance and interface graphics changed the most. Users will have to get used to a new, readable way of navigation, referring to the options from the locally installed application. Initial tests seem promising, and we hope that the new architecture will be well received. The external appearance is not everything. Changes go deeper. We will skip the technical details because of their confidentiality. The main change is the use of a completely new database engine designed to collect measurement data often sent in large portions. In parallel, it is a new architecture that shares registered data as quickly as it acquires.



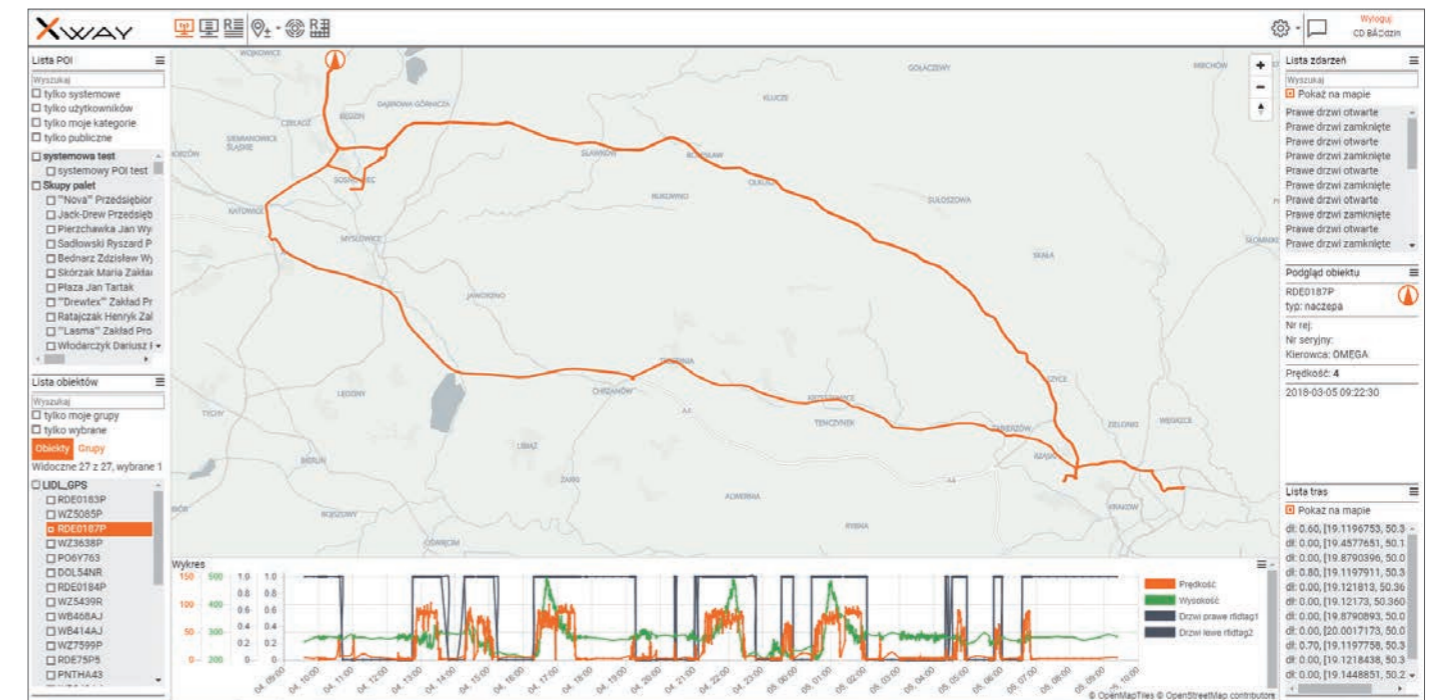
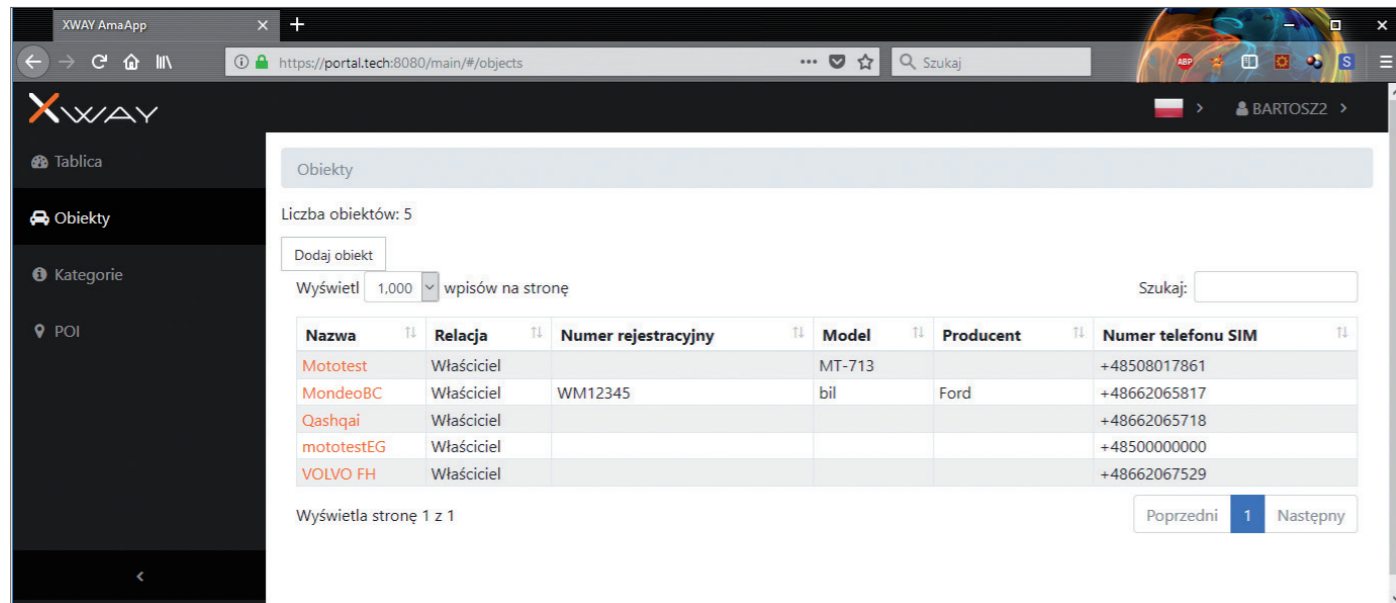
As in the previous version, we also provide users with the ability to manage their objects from the browser.

Completely new graphics are the main changes in the interface that is visible immediately after logging in. The map is still in a central position and is the most important element of online monitoring. In the online version, we have decided to use open-source maps, which are updated by users from around the world. Thanks to this approach, we will be able to develop updates more

frequently than in the previous version. There will also be known navigation panels that were available in the desktop version. There will also be new panels, so far unavailable, e.g. current chart with the possibility of plotting any trend selected from the registered data. New panels will be permanently docked, but it will be possible to change their size. Each user will be able to personalize the application settings according to personal preferences and save them in his own profile.

Nazwa	Kod	Zlecony	Status	Od kiedy	Do kiedy		
Raport zalecenia/wykladunku	RP-1	2.02.2018, 13:57:09	gotowy	1.02.2018, 13:57:09	2.02.2018, 13:57:09	🔍	🗑️
Raport zalecenia/wykladunku	RP-1	3.02.2018, 12:08:35	gotowy	1.02.2018, 12:08:35	2.02.2018, 12:08:35	🔍	🗑️
Paliwo - wykres	RP-1	28.01.2018, 20:18:16	gotowy	27.01.2018, 20:18:16	28.01.2018, 20:18:16	🔍	🗑️
Paliwo - wykres	RP-1	26.01.2018, 08:55:01	gotowy	25.01.2018, 08:55:01	26.01.2018, 08:55:01	🔍	🗑️
Paliwo - wykres	RP-1	25.01.2018, 15:32:49	gotowy	24.01.2018, 15:32:49	25.01.2018, 15:32:49	🔍	🗑️
Napięcie akumulatora - wykres	RP-6	23.01.2018, 12:22:56	gotowy	20.01.2018, 12:22:56	23.01.2018, 12:22:56	🔍	🗑️
Napięcie akumulatora - wykres	RP-6	12.01.2018, 12:00:20	gotowy	24.11.2017, 11:59:47	12.01.2018, 12:00:20	🔍	🗑️
Paliwo - wykres	RP-1	12.01.2018, 11:59:26	gotowy	1.01.2018, 11:58:00	12.01.2018, 11:59:26	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	11.01.2018, 12:20:06	gotowy	9.01.2018, 12:20:06	11.01.2018, 12:20:06	🔍	🗑️
Raport eksploatacji	RP-1	8.01.2018, 08:49:49	gotowy	4.01.2018, 02:00:58	8.01.2018, 08:49:49	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	21.12.2017, 12:24:08	gotowy	18.12.2017, 12:23:27	21.12.2017, 12:24:08	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	20.12.2017, 22:52:07	gotowy	18.12.2017, 22:51:37	20.12.2017, 22:52:07	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	20.12.2017, 12:16:12	gotowy	19.12.2017, 12:16:12	20.12.2017, 12:16:12	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	20.12.2017, 10:57:20	gotowy	18.12.2017, 12:56:11	20.12.2017, 10:57:20	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	20.12.2017, 10:43:06	gotowy	18.12.2017, 10:43:06	20.12.2017, 10:43:06	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	20.12.2017, 09:48:03	gotowy	18.12.2017, 13:00:52	20.12.2017, 09:48:03	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	20.12.2017, 00:21:54	gotowy	18.12.2017, 00:21:11	20.12.2017, 00:21:54	🔍	🗑️
Temperatura 2 sensory - wykres D1	RP-7	19.12.2017, 22:41:12	gotowy	17.12.2017, 22:40:40	19.12.2017, 22:41:12	🔍	🗑️
Raport zdarzeń poza obszarami	AR-4	4.12.2017, 18:01:45	gotowy	29.11.2017, 18:01:02	30.11.2017, 18:01:02	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	4.12.2017, 17:59:04	gotowy	29.11.2017, 17:58:06	30.11.2017, 17:58:06	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	4.12.2017, 17:25:50	gotowy	29.11.2017, 17:23:49	30.11.2017, 17:23:49	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	4.12.2017, 15:57:17	gotowy	29.11.2017, 15:56:32	30.11.2017, 15:56:32	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	4.12.2017, 11:17:27	gotowy	29.11.2017, 11:15:55	30.11.2017, 11:15:55	🔍	🗑️
Raport zdarzeń w obszarach	AR-3	4.12.2017, 11:09:06	gotowy	29.11.2017, 11:07:31	30.11.2017, 11:07:31	🔍	🗑️
Raport dzienny - zbiorczy	RD-3	28.11.2017, 16:16:40	gotowy	27.11.2017, 00:00:00	28.11.2017, 16:16:40	🔍	🗑️

The administration panel also has a new graphic design. As before, it will be possible to register the device and manage hardware and personal resources. Most functions will remain unchanged regarding the operation logic and



will allow you to modify the properties of your objects and resources. However, we are changing the authorization system of granting rights to the user. In the new version, the administrator will be able to assign various privileges to users, i.e. to the monitoring function, viewing historical data, generating reports, managing POI areas, or accessing the configuration of their devices. The novelty will be the rights to individual measurement signals and object-related events (e.g. refuelling). The administrator will be able to grant or remove another user rights to specific signals on selected monitoring objects. Similar rules will apply to report forms. The administration panel will also provide a log that saves changes made by users.

Raport dzienny - szczeblowy RD-2
2018-01-15 15:12:35 - 2018-01-15 15:12:35
Dni robocze: Po Wt Śr Czw Pt

MondeoBC(799) | WM12345(789) | Kinga

2018-01-15

Lp.	Adres	Przyjazd	Czas postoju	Wyjazd	Czas jazdy	Długość odcinka	Prędkość średnia	Palivo Tank/Ubytek
1	Aktura i Franciszka Radziwiłłów, 05-850 Ożarów Mazowiecki, RP	---	---	15:34	0:16	10.39999999999994	35	0 / 0
2	Łąkowa 16B, 05-860 Płochocin, RP	15:52	3:32	19:24	0:05	1.200000000000116	15	0 / 0
3	Za Lipami 4, 05-860 Wólka, RP	19:29	1:10	20:39	0:04	1.199999999999925	17	0 / 0
4	Łąkowa 18, 05-860 Płochocin, RP	20:43	10:11	06:55	0:16	10.20000000000012	38	0 / 0
5	Aktura i Franciszka Radziwiłłów, 05-850 Ożarów Mazowiecki, RP	07:11	---	---	---	---	---	0 / 0

2018-01-16 15:13:02 Raport wygenerowany przez system WexWay

Also, the Report Engine was written completely from the beginning. We designed it specifically for the new structure of the database, including multithreaded work and the possibility of replication in the case of expanding computational resources. The new reports will operate on demand or in schedule mode. Initially, they will only handle time-based orders. In the next stage, we will add support for object events. The selected report will be generated in the case of a real occurrence of the event, e.g. exceeding the speed limit. The completed reports will be stored in the system and sent via e-mail as an attachment. On the Internet platform, we plan to recreate all report templates that are available in the current version. We will introduce numerous changes in the form of presentations on this occasion, but the general idea will remain unchanged. As before, the reports can be downloaded as a .pdf and .csv file to a local computer. We will also add

Raport szczeblowy RD-1
2017-12-19 20:49:11 - 2017-12-20 20:49:11
MondeoBC(789) | WM12345(789) | Kinga

Zdarzenie	Data	Wartość / Czas	Adres	Dystans od poprzedniego zdarzenia (km)	Dystans od początku trasy (km)
Zapłon włączony (t)	2017-12-20 05:59:00	---	Łąkowa 18, 05-860 Płochocin, RP	0	0
Zapłon włączony (t)	2017-12-20 07:05:49	---	Kasztanowa 12, 05-860 Józefów, RP	1.5	1.5
Zapłon włączony (t)	2017-12-20 07:11:58	---	Kasztanowa 12, 05-860 Józefów, RP	1.5	1.5
Zapłon włączony (t)	2017-12-20 07:31:39	---	Aktura i Franciszka Radziwiłłów, 05-850 Ożarów Mazowiecki, RP	12.799999999999988	12.799999999999988
Zapłon włączony (t)	2017-12-20 15:38:30	---	Aktura i Franciszka Radziwiłłów, 05-850 Ożarów Mazowiecki, RP	12.799999999999988	12.799999999999988
Zapłon włączony (t)	2017-12-20 16:05:53	---	Łąkowa 05-860 Wólka, RP	23.399999999999994	23.399999999999994
Zapłon włączony (t)	2017-12-20 16:19:42	---	Za Lipami 3, 05-860 Wólka, RP	23.399999999999994	23.399999999999994
Zapłon włączony (t)	2017-12-20 16:22:11	---	Kasztanowa 12, 05-860 Józefów, RP	24.199999999999993	24.199999999999993
Zapłon włączony (t)	2017-12-20 16:32:17	---	Kasztanowa 12, 05-860 Józefów, RP	24.199999999999993	24.199999999999993
Zapłon włączony (t)	2017-12-20 16:40:59	---	Łąkowa 16C, 05-860 Płochocin, RP	26	26
Zapłon włączony (t)	2017-12-20 17:43:31	---	Łąkowa 16B, 05-860 Płochocin, RP	26	26
Zapłon włączony (t)	2017-12-20 17:58:13	---	Poznańska, 05-850 Ożarów Mazowiecki, RP	34.100000000000006	34.100000000000006
Zapłon włączony (t)	2017-12-20 17:59:47	---	Poznańska, 05-850 Ożarów Mazowiecki, RP	34.100000000000006	34.100000000000006
Zapłon włączony (t)	2017-12-20 17:57:17	---	Poznańska, 05-850 Ożarów Mazowiecki, RP	34.100000000000006	34.100000000000006
Zapłon włączony (t)	2017-12-20 18:22:19	---	Poznańska, 05-850 Ożarów Mazowiecki, RP	34.100000000000006	34.100000000000006
Zapłon włączony (t)	2017-12-20 19:35:55	---	Za Lipami 4, 05-860 Wólka, RP	43.199999999999993	43.199999999999993
Zapłon włączony (t)	2017-12-20 20:35:21	---	Za Lipami 4, 05-860 Wólka, RP	43.199999999999993	43.199999999999993
Zapłon włączony (t)	2017-12-20 20:39:22	---	Łąkowa 18, 05-860 Płochocin, RP	44.399999999999994	44.399999999999994

2017-12-20 20:50:52 Raport wygenerowany przez system WexWay

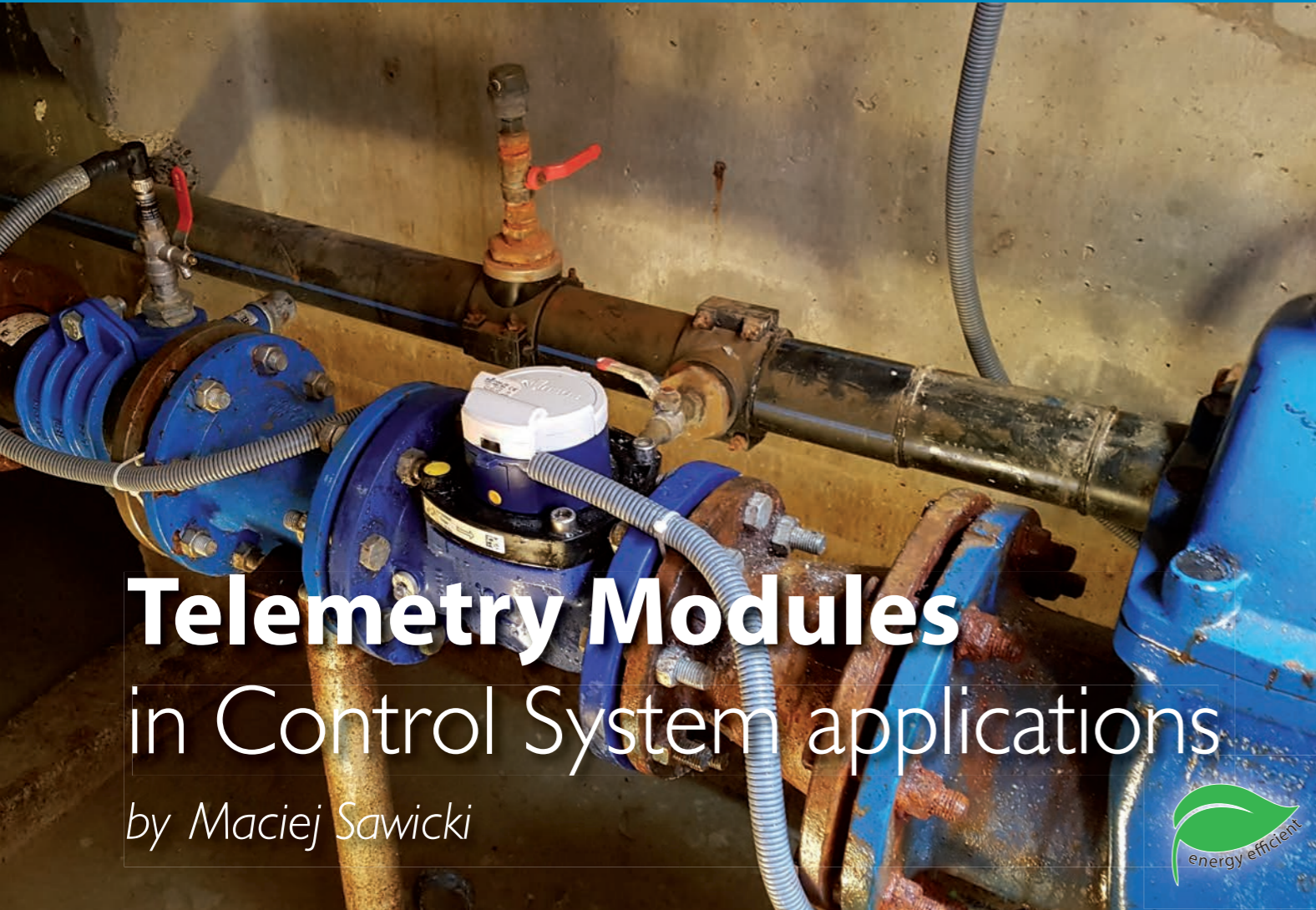
a report archive, where all generated forms will be saved, with the option of returning to viewing and re-reading.

The scheduled report generator will simultaneously work as a notification module. This is new functionality that is not available in the XwayMAP application. Notifications are limited to sending messages to the user with information about the occurrence of a significant event, e.g. opening the cargo space in forbidden place. Notifications will be sent by post and via SMS. The distribution of messages will also be carried out when we are not logged in, and we do not monitor the situation on a regular basis.

XwaySystem undergoes metamorphosis. Day after day, we are approaching the launch of the new version. The official date is not yet decided. Work is still underway on the implementation of a part of the functionality. Initially, we plan to make the new version available in the fourth quarter of 2018. Then all users of the XwayMap program will be able to log in to the new application directly in their favorite web browser. Soon, we will make the new test interface available to interested users. We invite you to participate in the test program. We are also waiting for comments or suggestions on what functionalities should offer.

When developing the project, we benefited from EU subsidies under the Operation Program OP 2.3.2 Tickets for Innovations for SOHO, project number POIR.02.03.02-14-0014/16-01, "Development and implementation of the GreenWay internet platform with a reading of tachographs and driver cards and a notification module."





Telemetry Modules in Control System applications

by Maciej Sawicki



The use of advanced functionality of the new generation telemetry modules MT-151, MT-331, MT-713/723 from InVentia in applications developed and implemented by the Control System company – edition 02'2018

Introduction

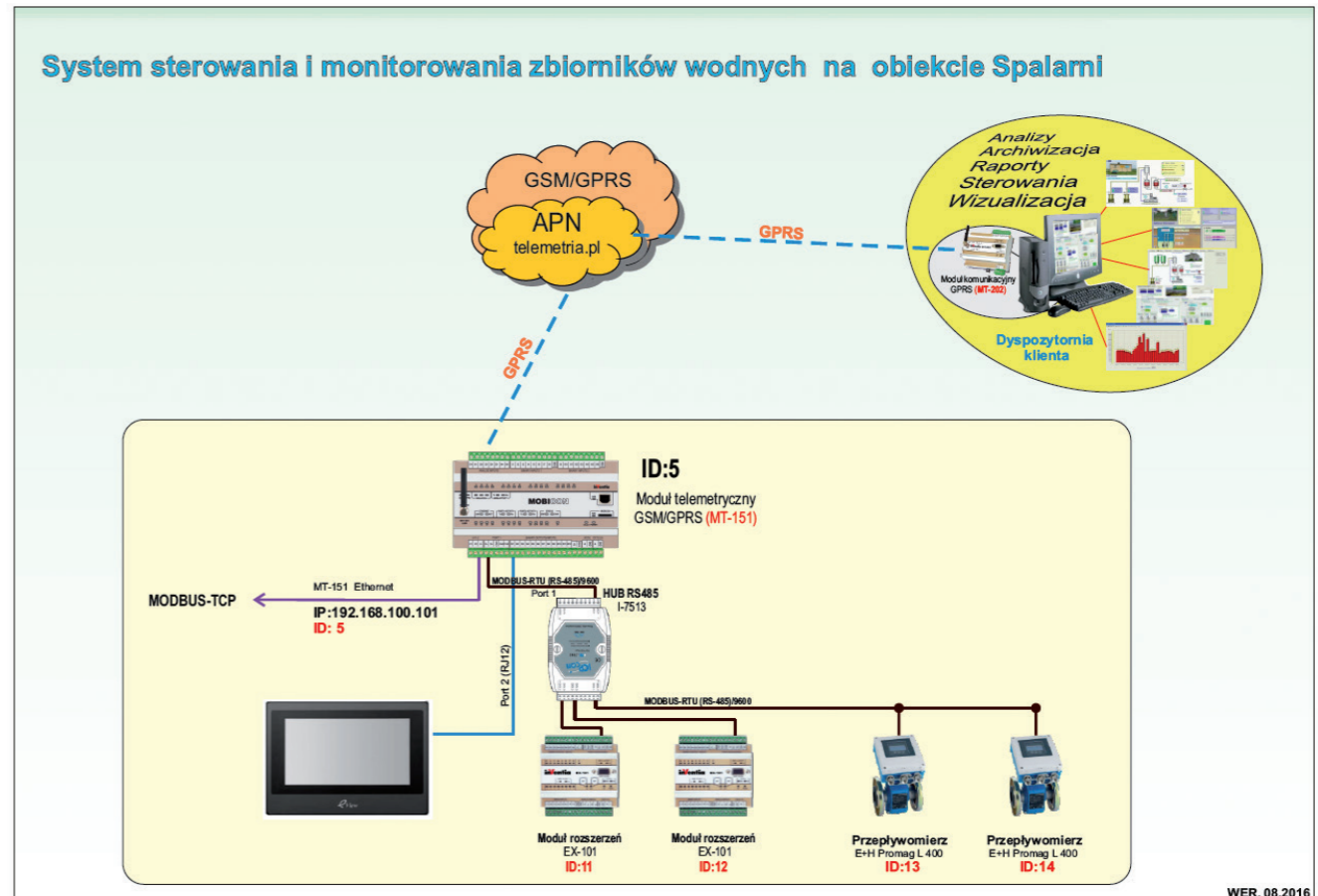
Dear readers of the TELEMETRON magazine, We are giving you another article containing the description of the most interesting application solutions implemented by the CONTROL SYSTEM engineers. Traditionally, this edition is a continuation of publications contained in the issues of TELEMETRON magazine from 2008-2017. In the latest edition of the article, as in previous years, we would like to present the most interesting and technically

advanced implementations launched in 2017, together with our partner companies as well as independently, by an experienced team of CONTROL SYSTEM engineers. We have been consistently focusing on the implementation of topics that require expertise knowledge and many years of experience while remembering that our main goal is to create final high-quality applications that guarantee users that they have received the product they expected. In 2017, our team implemented applications based on new generation modules, i.e. MT-151 LED/HMI, MT-251 3G and MT-331. The increased resources available in the MT-151 LED/HMI module combined with the high efficiency of a modern processor, floating point numbers and the implementation of protocols allowing communication with external devices through RS-485 and ETHERNET ports, significantly increased functional capabilities. The MT-251 communication gateway in the 3G version and the WELOTEC series TK500/700/800 routers enabled the trouble-free processing of data streams generated in networks containing over 150 telemetry modules. In many applications, the MT-331 module was used, which due to the possibility of working in two power supply modes turned out to be a very interesting device.

The closing balance of 2017 is a total of over 10,200 modules working without failure in Poland and Europe, with application software developed by CONTROL SYSTEM engineers.

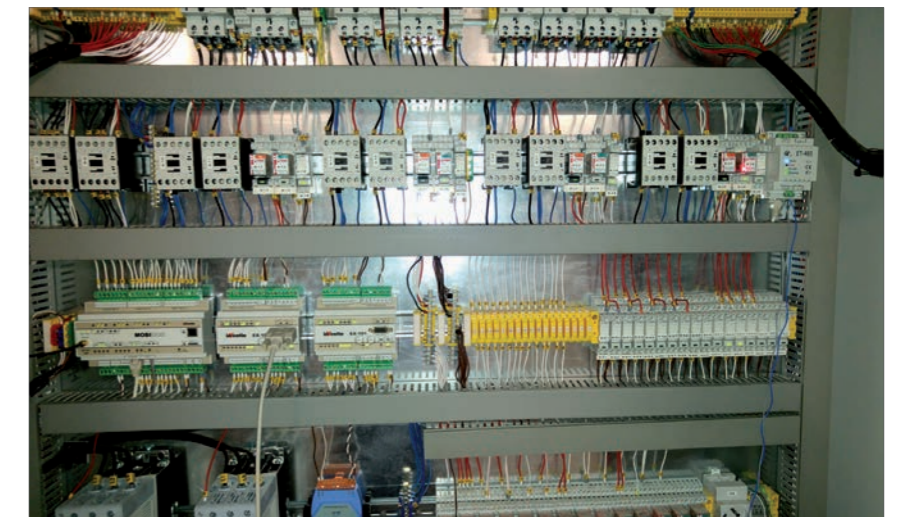
In the next thematic blocks, we summarize the most interesting examples of telemetry modules applications.

The diagram illustrates how great potential the MT-151 module provides to both the developers of the control system and the user. In addition to the local visualization, available on the graphic panel mounted on the face of the control cabinet door, the measurement data are additionally transmitted, using the ETHERNET bus, to an integrated, extended BMS system supervising the full technological process on this object.

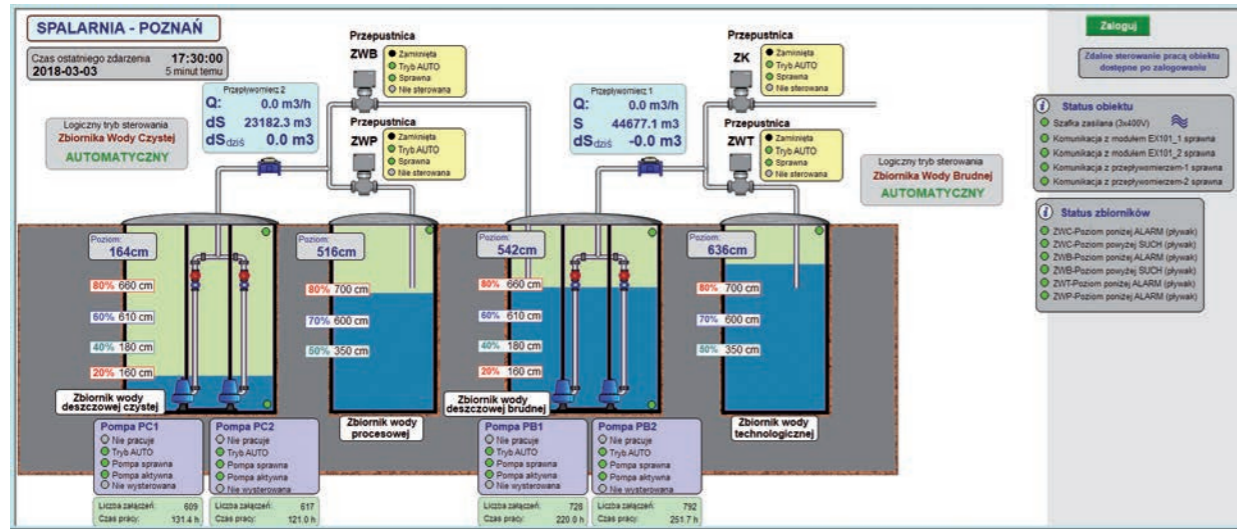


Environmental protection – MT-151 LED control module together with EX-101 modules part of the pumping water process in a waste incineration plant

The application described below uses the multi-processor control structure commonly used in our applications. The MT-151 LED module together with the EX-101 modules performs the control process of pumps and dampers. Each of the three modules is associated with its own application that implements part of the control process. Telemetry modules are connected with each other by RS-485 bus. The electromagnetic flowmeters are also connected to this communication bus. Above is shown the communication scheme.

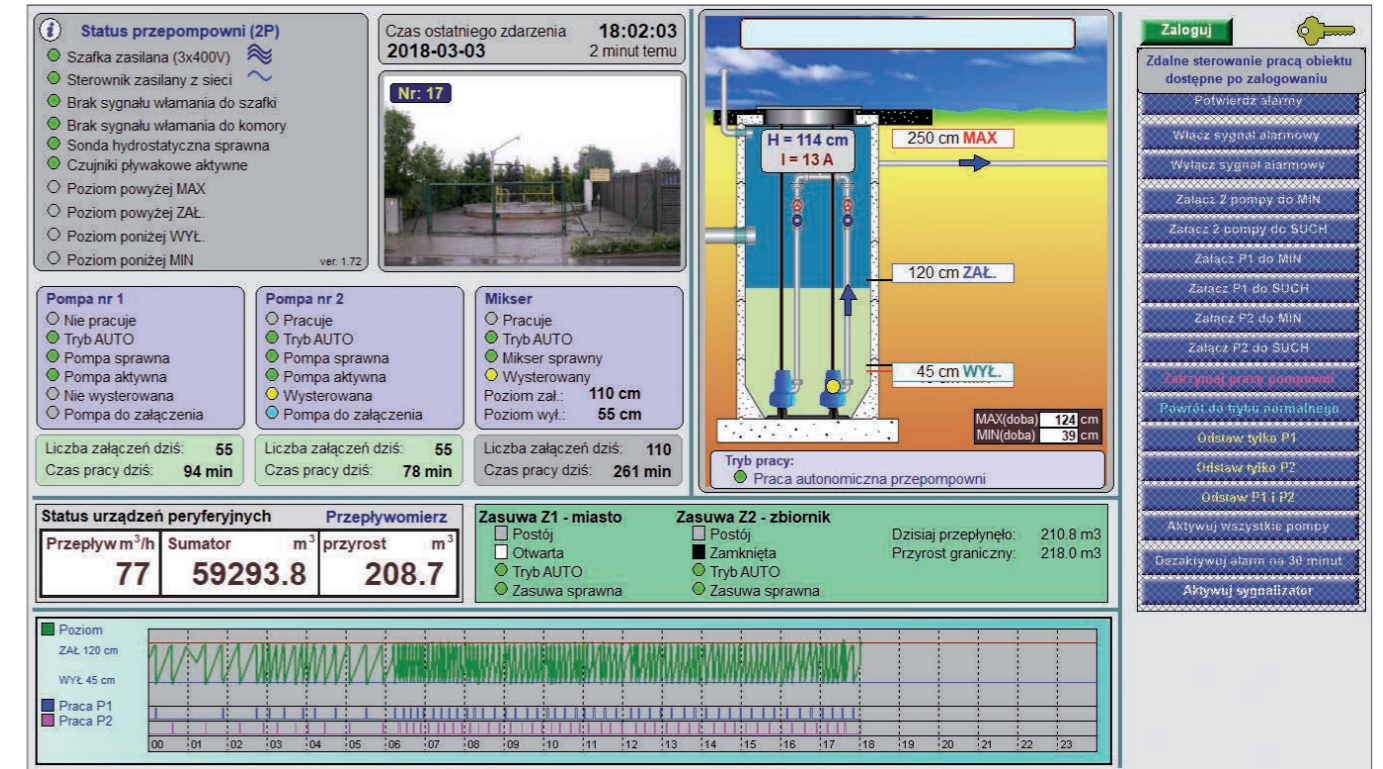
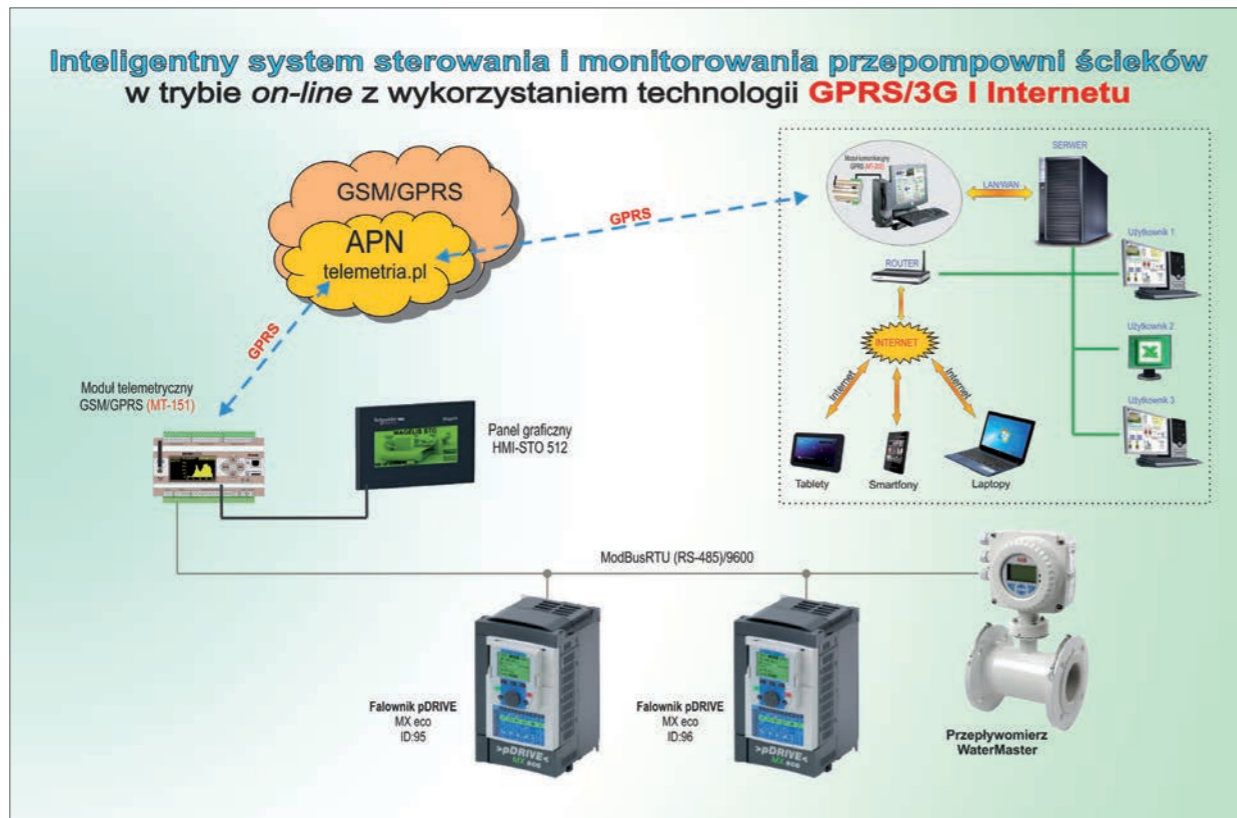


Additionally, the described solution used the ability of the MT-151 module to send data using GPRS/3G technology to a dedicated, secure database server, which allows our engineers to remote control over the correct operation of the control process without access to the BMS system protected from outside interference.



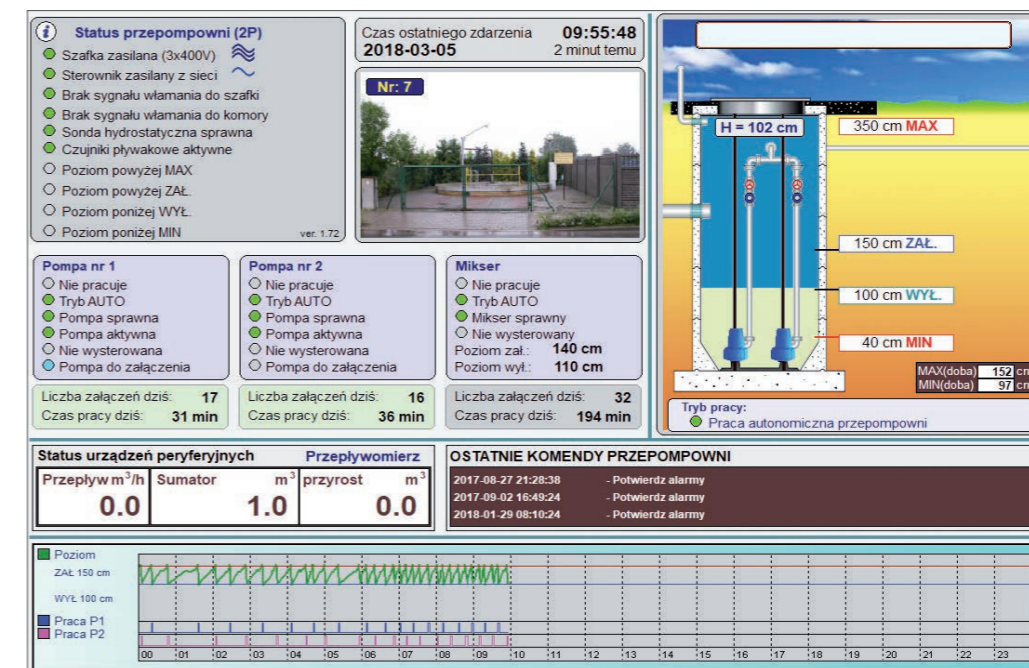
Standard and advanced algorithms for controlling pumping stations and sewage pumping stations using the MT-151 module

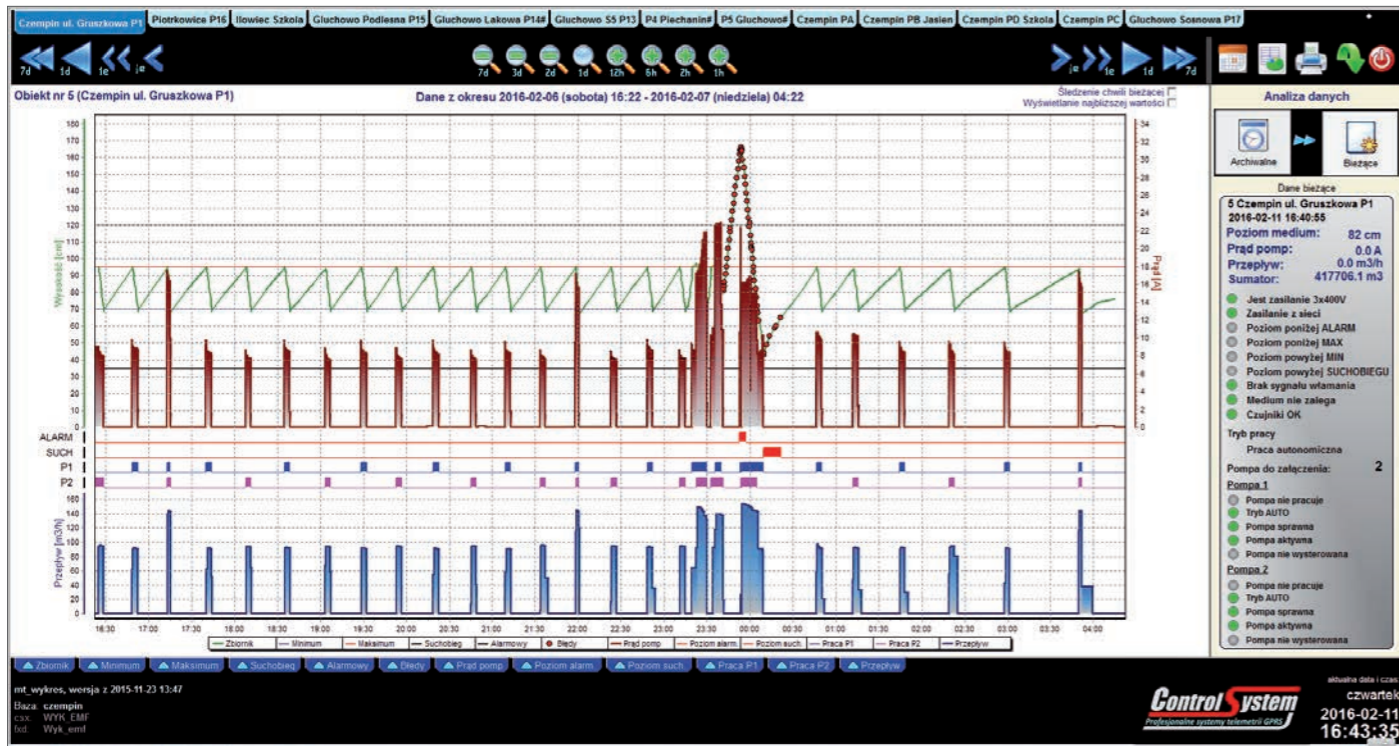
The MT-151 LED and HMI telemetry modules are currently dominating in pumping station control systems and sewage pumping stations. Over the past three years, our team of developers has significantly expanded the functional capabilities of application software and implemented several spectacular implementations.



In addition to standard applications for pumping stations and sewage pumping stations, our team of engineers carried out more advanced projects for our business partners related to the control of additional devices, e.g. mixers and gate valves. In this type of applications, it was necessary to control the amount of sewage discharged to the treatment plant in an hourly cycle, which forced the use of algorithms with prediction functions and sewage buffer in an additional retention tank and control of the valves operation to empty the tank cyclically.

In the case of fish processing plants, due to the structure of sewage, it was necessary to use additional mixers.





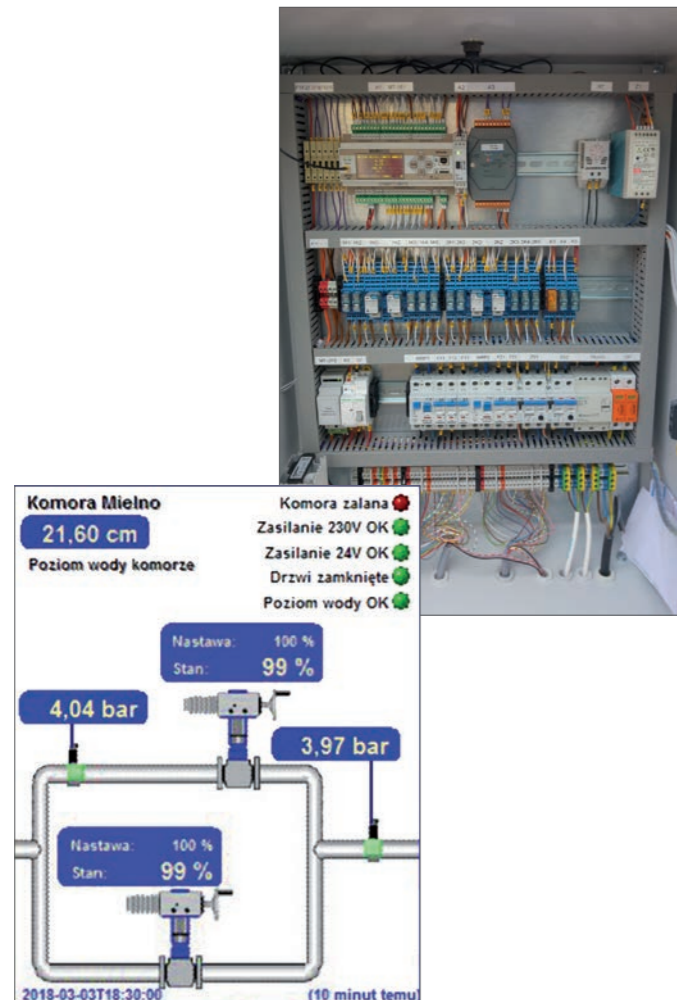
The integrated graphic display, available in the HMI version, enabled the local service staff to visualize the most important process parameters without the need for the additional external graphic panel, costing at least a few hundred PLN.

Thanks to the extended resources of the MT-151 module, e.g. in the case of sewage pumping stations, it became possible to implement in one software module a dehydration pump control as well as an additional fan designed for ventilation of the dry chamber. The possibility of connecting external temperature sensors to the MT-151 module allows for more precise maintenance of the set temperature in the control cabinet. The above extension of functions performed by the MT-151 module minimizes the number of additional elements included in the cabinet's equipment. As a result, the use of the MT-151 module not only does not increase the costs of implementing the control cabinet but guarantees that the control of additional devices will be implemented by the application software stored in the memory of the MT-151 module, and all required additional information will be transferred to the superior SCADA system.

MT-151 HMI module that controls the dampers in the measurement chambers on the clean water installations, subsequent implementations

Proven in the first applications, for this class of facilities, functional capabilities offered by the MT-151 module led to the implementation of subsequent implementations of the process of water flow control in the water supply network, to optimize the costs associated with its management.

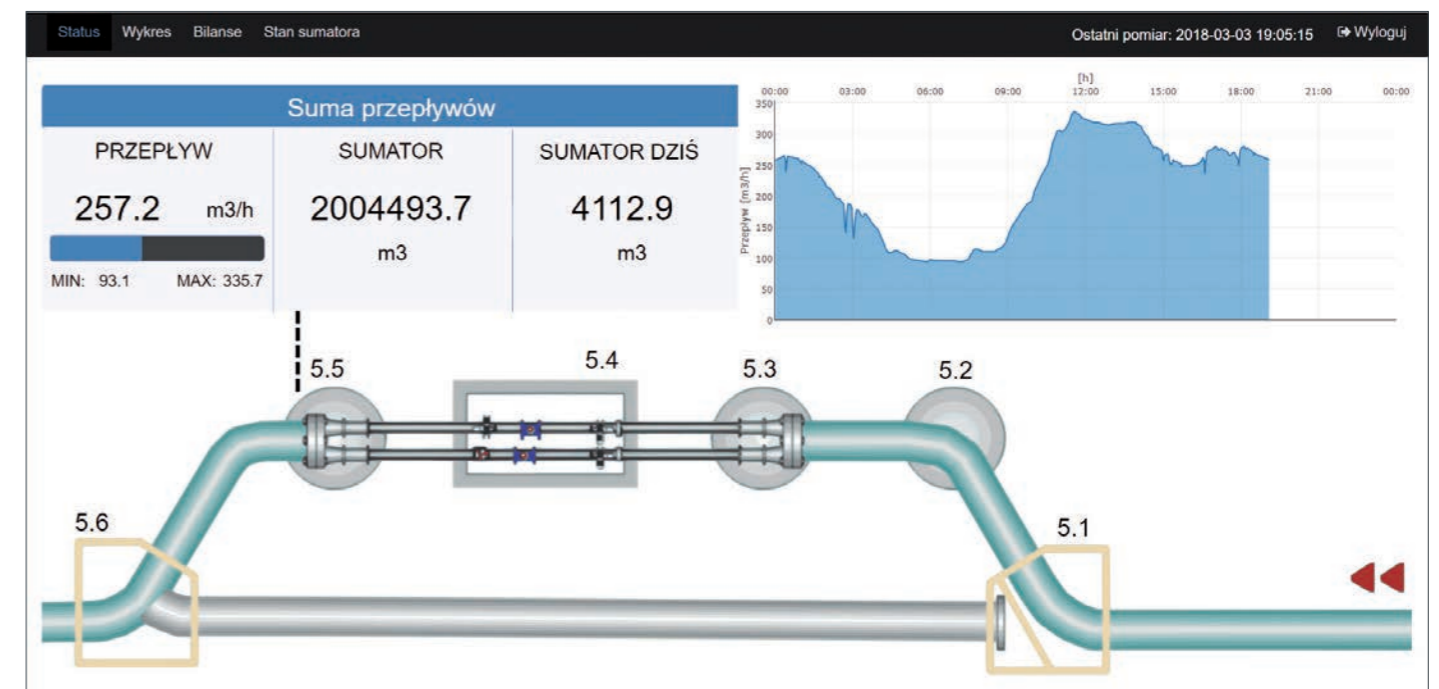
On the illustration is shown the example of controlling the operation of two gate valves on the main water pipes in Mielno together with visualization.



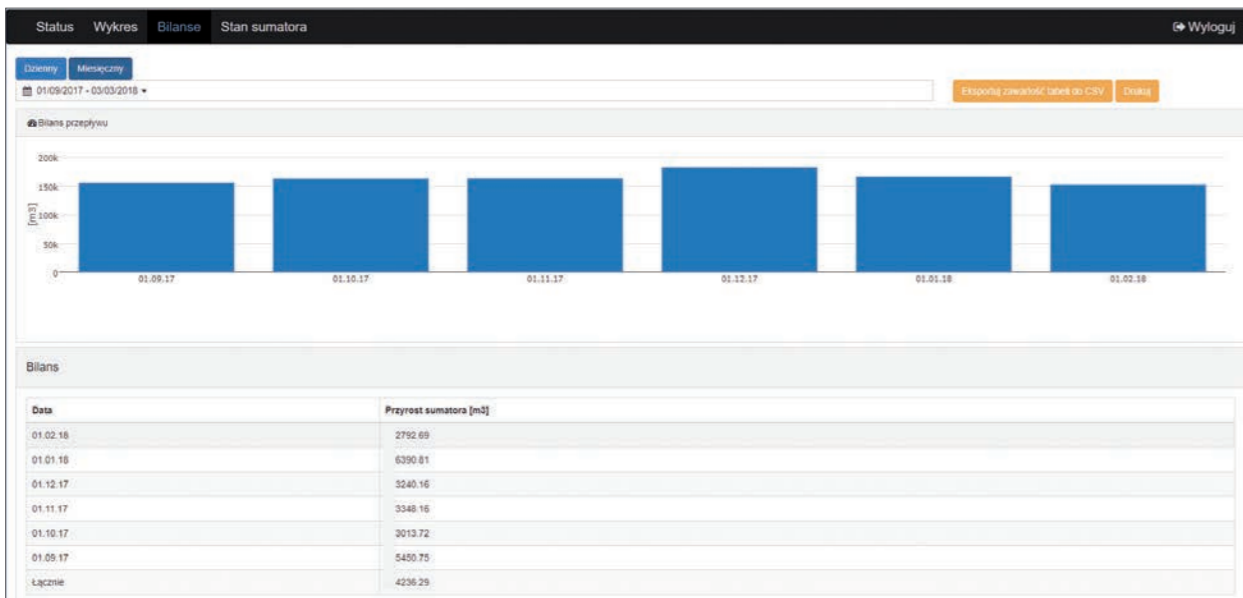
The presented examples of applications illustrate the functional possibilities offered by the MT-151 telemetry module, which in such cases successfully replaces a traditional PLC connected to a GSM modem. Integration of process control and data transmission (3G) functions in a single module with the possibility of remote modification of the program in MT-151 significantly reduces the costs associated with running the facility.

Measurement of sewage flows on transit pipes with the use of electromagnetic flowmeters – modern cloud solution for visualization with access to data from a web browser

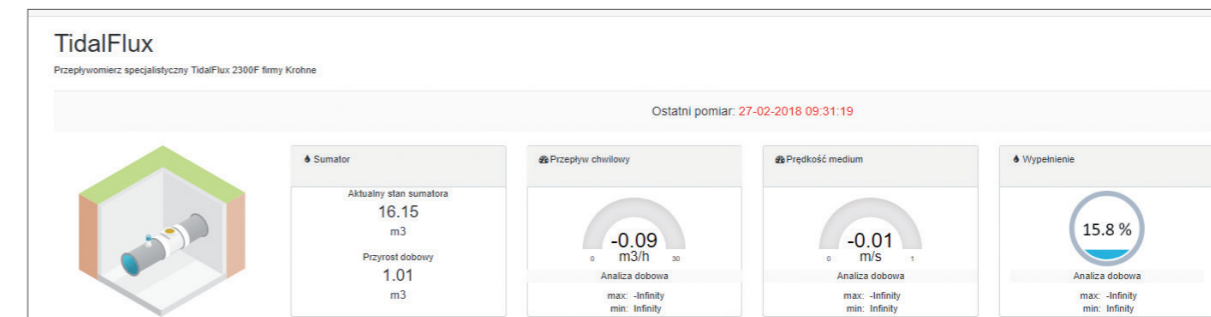
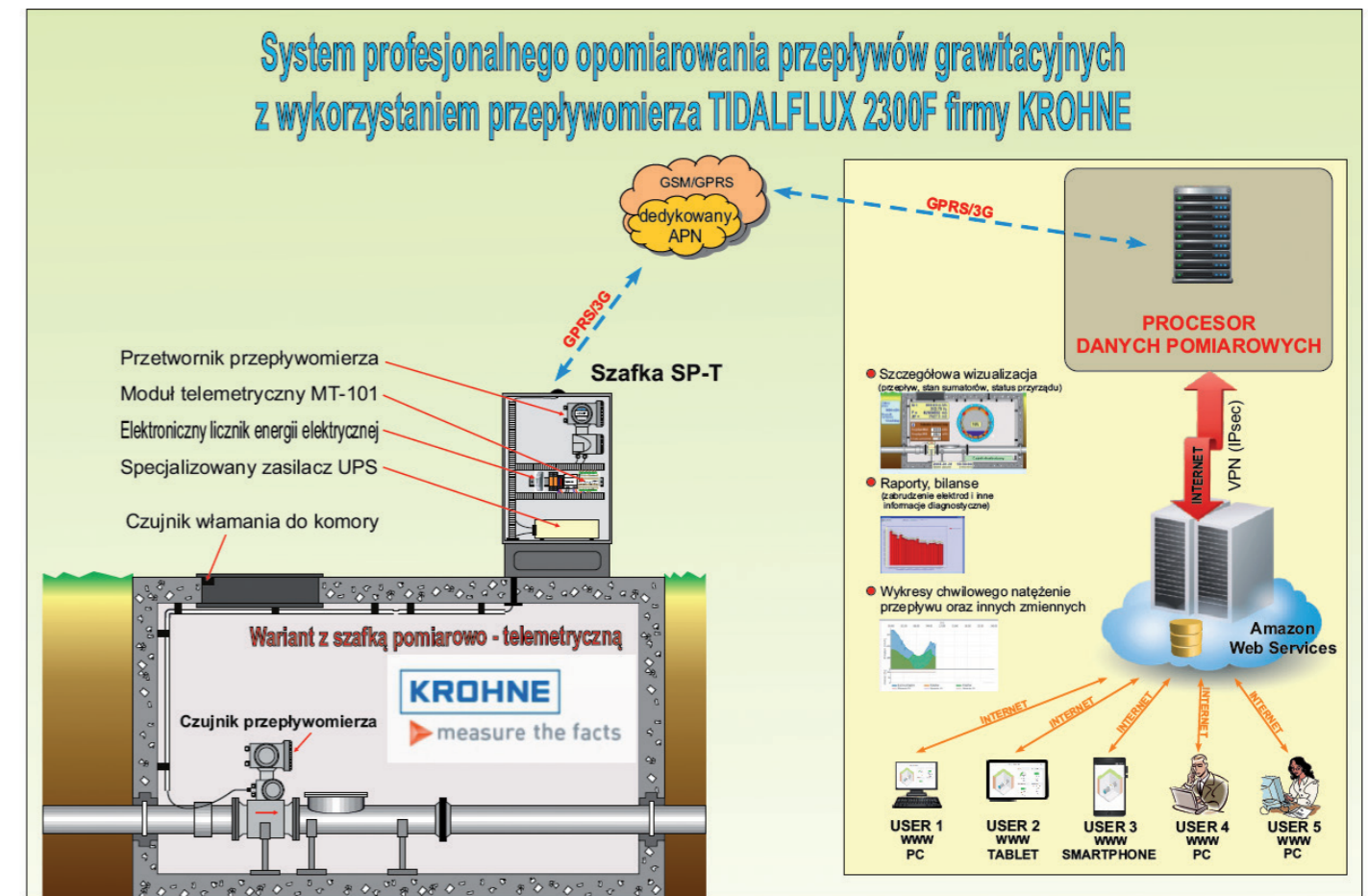
In 2017, our team intensively developed a new generation of cloud application to visualize the measurement processes on distributed objects based on access to data from a web browser. A dedicated, professional internet application has been developed for this purpose. It provides secure data access and visualization of the measurement process. It was assumed that the main goal would be to obtain secure and reliable access to data from the web browser, both on stationary and mobile devices. The latest available information technologies were used to create the application. Full scalability and responsiveness of the site were ensured by using vector graphics of the SVG format, as well as the Bootstrap library. Thanks to this solution, the content of the page adapts to the size of the screen on which it is displayed. The capabilities of JavaScript, HTML5, and CSS3 were also used. Below is shown an example of visualization of sewage flow in a solution strictly intended for billing purposes, i.e. settling receivables for the transfer of wastewater to a sewage collector connecting two municipalities.



Below are flow charts and balance sheets.

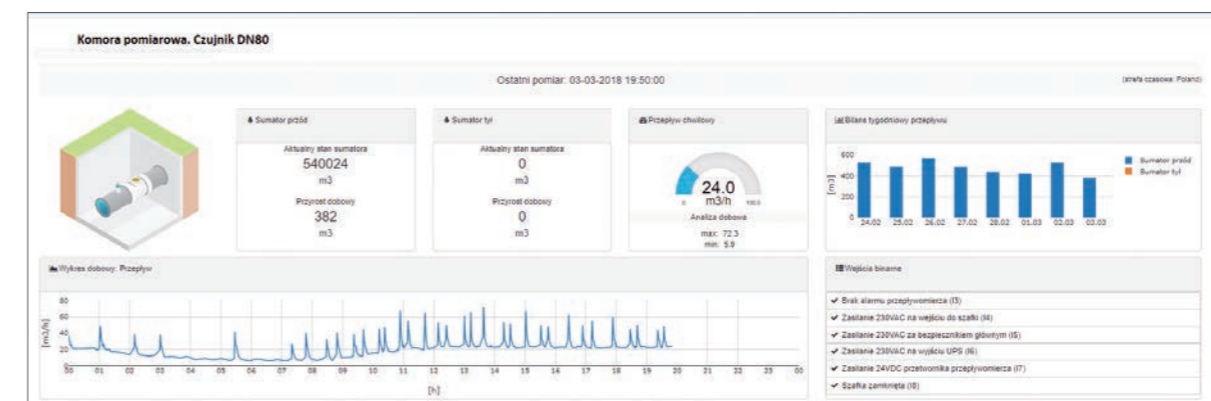


The number of implementations of InVentia telemetry modules in applications dedicated to billing purposes is growing rapidly. Our team of engineers prepared in 2017 a dedicated measurement system for gravitational metering of wastewater flow, based on the professional TIDALFLUX 2300F flowmeter from German company Krohne, using the latest measurement technologies. The measuring system includes, of course, telemetry set with a cloud application for the visualization of the measurement process and a billing module. Below is a block diagram of a complete, professional system for gravity metering of wastewater. The system consists of a measuring chamber with a specialized TIDALFLUX 2300F flowmeter, a dedicated measuring and telemetric cabinet, containing, among others, MT-101 telemetry module, and a modern cloud application for the visualization of the measurement process with chart modules for calculating balances.

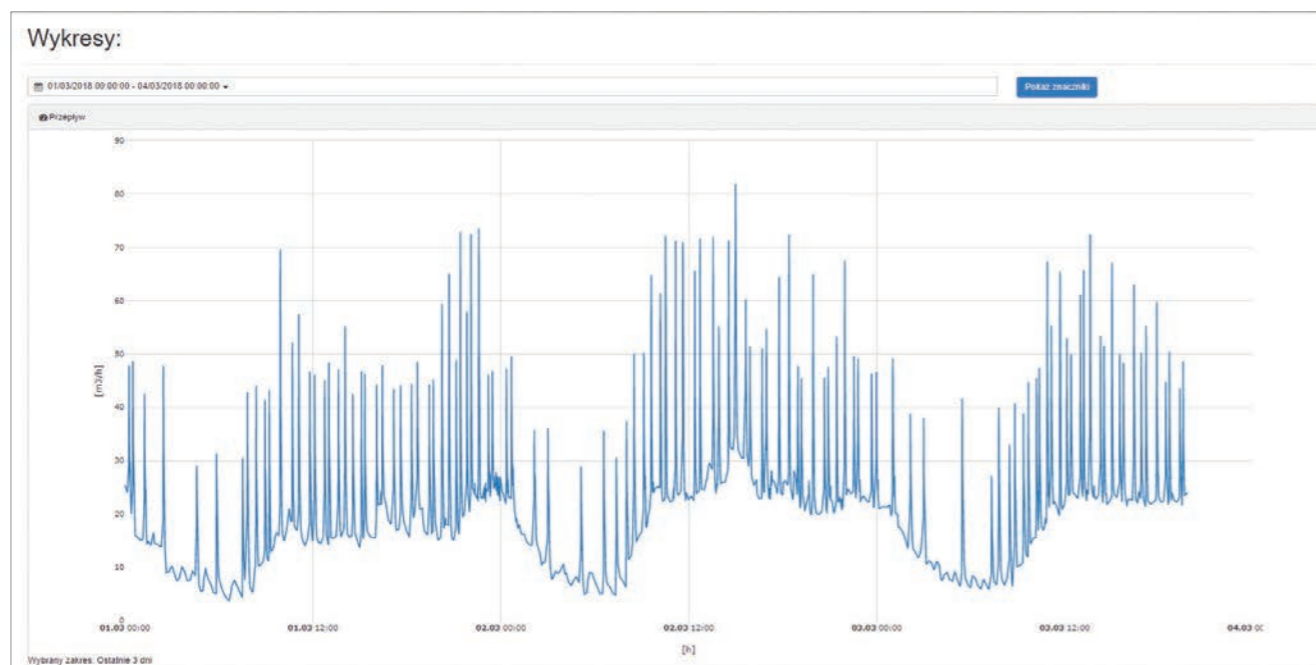


Above is the screenshot of a cloud visualization dedicated to the TIDALFLUX 2300F flowmeter. In the right part of the window, there is an additional field informing about the level of sensor filling.

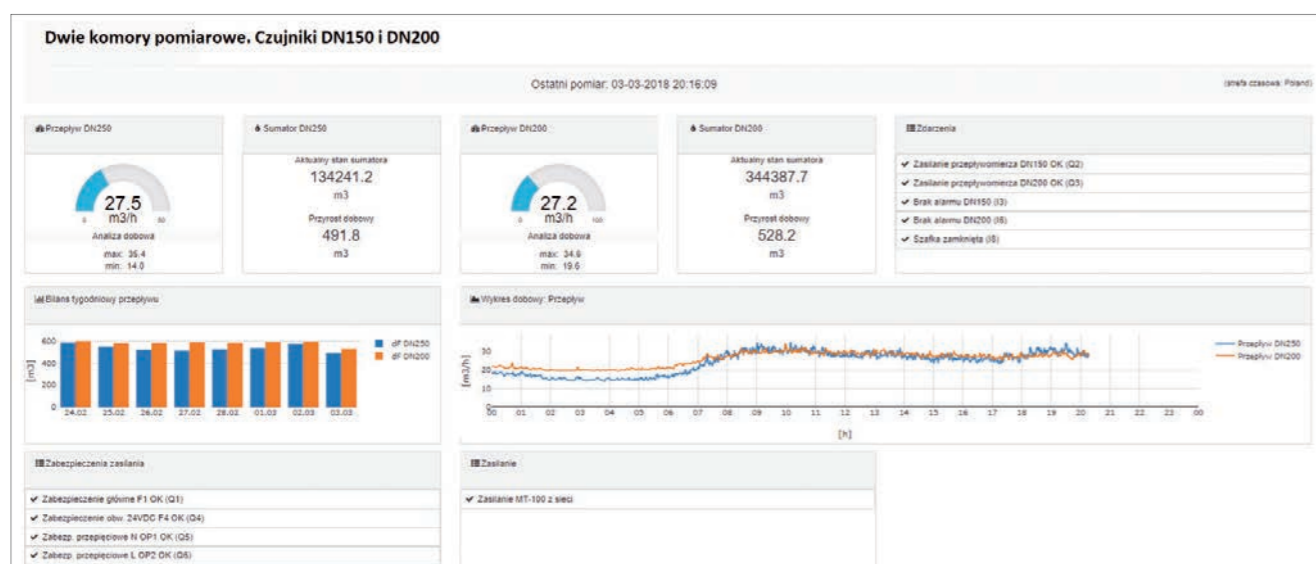
For flowmeters dedicated to pressure flows, the appearance of the application automatically adapts to the type of flowmeter.



The graphs below show the modulation of the flow caused by the operation of the sewage pumping station, which presses the sewage into the pipeline in a pulsatile manner.



At the end of this thematic block, an example of the visualization of two measuring chambers with electromagnetic flowmeters with sensors of diameters DN150 and DN200. Measurement data is integrated on one screen for easier analysis.



Telemetry modules MT-331, MT-713, MT-723 in applications for monitoring flows and pressures in measuring chambers. Powering the measuring system from batteries or renewable energy sources
Measurement in measuring chambers on which there is no 230 V available due to the distance from LV power lines, requires the use

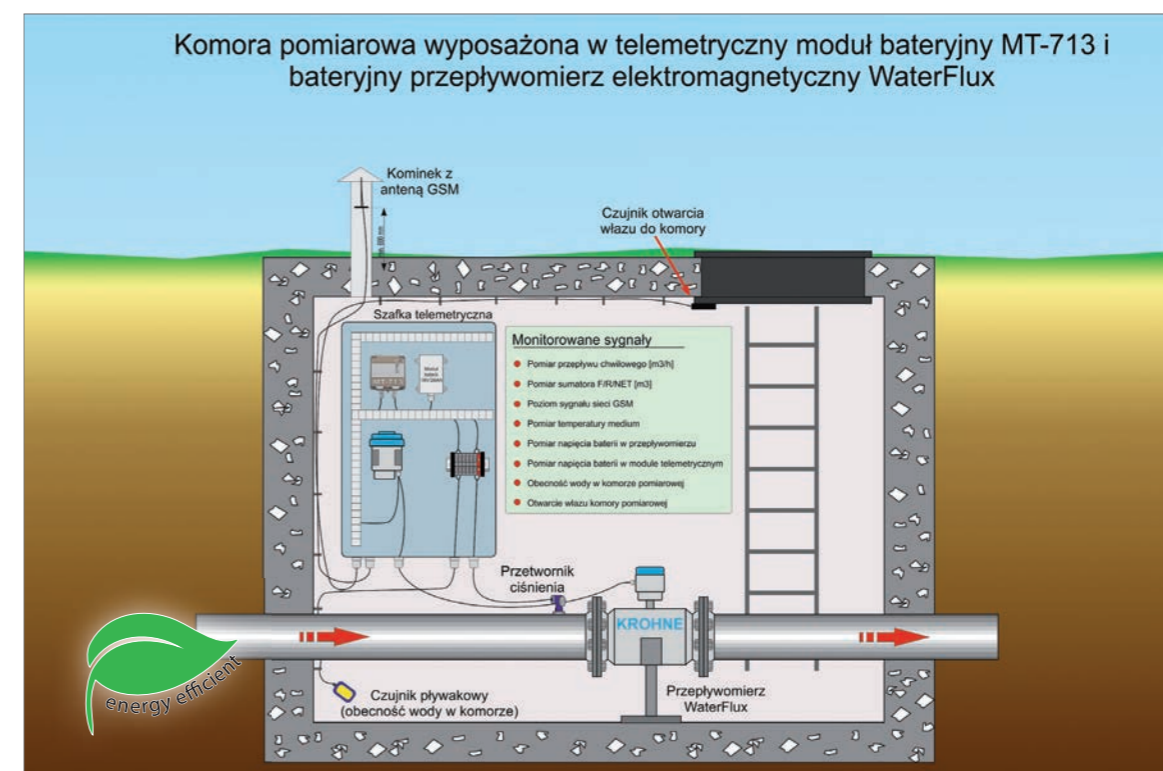
of telemetric modules and battery-operated measuring devices, rechargeable batteries, or the use of renewable energy sources. An interesting example can be the reservoir located in the picturesque fields in Zubrzyce.

two pumps that pump water into the reservoir. For this task, a special power and telemetry cabinet was made. It contains two batteries adapted for cooperation with the photovoltaic panel, MPPT controller and MT-331 module.



The water level in this reservoir must be maintained in the upper zone to ensure the continuity of water supply for residents. Information on the current level of water should be sent to the MT-151 module installed on a remote pumping station, where there are

Measuring chambers equipped with traditional water meters or battery-operated electromagnetic flowmeters are a category of objects in which the energy saving telemetry modules series MT-331/713/723 should be used.



For the needs of our business partners, a new dedicated measuring system was developed in 2017. It enables the most accurate metering of flows and pressures in clean water pipelines.

In the professional solution presented on the previous page, a modern, specialized electromagnetic Krohne flowmeter WATERFLUX 3070F and the telemetry module MT-713 in a special version, i.e. powered from an external battery pack and equipped with a port for RS-485 digital communication with ModBus RTU protocol support were used. The possibility of digital communication between the WATERFLUX 3070F flowmeter and the MT-713 module allows for sending much more critical measurement and self-diagnostic information to the visualization system than in the case of simple solutions based only on information transfer via pulse and alarm output. In the case of battery-powered flowmeters, it is important to be able to adjust the speed of measurements to the dynamics of the flow of the measured medium. The implemented solution ensures obtaining the optimum ratio between the effective accuracy of the measurement system and battery life. The data logger built-in module MT-713 allows for accurate mapping of instantaneous values of flow and pressure on the graphs in the visualization system.

In the picture below an example of a measuring chamber equipped with a classic water meter and a pressure sensor is shown. By using the functions offered by the MT-331 module, even in such a simple case, important measurement and information data are sent to the visualization system, e.g. opening the measuring chamber, exceeding the permissible water level in the chamber, etc.

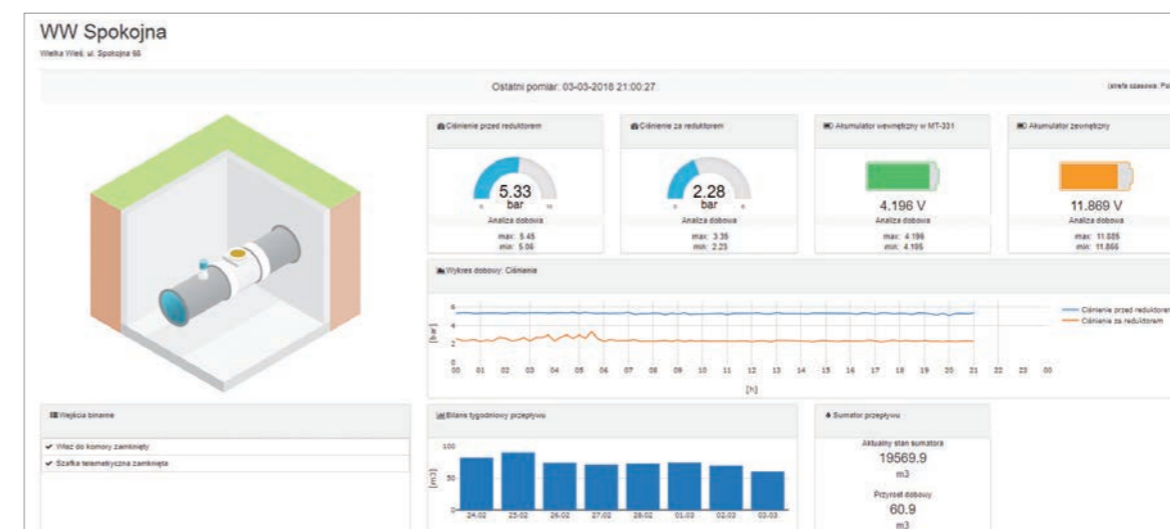
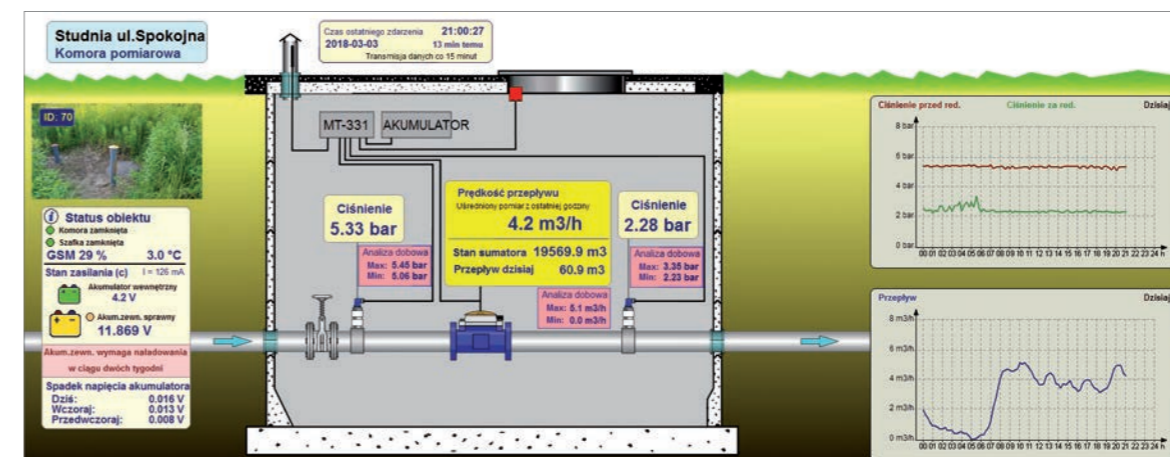


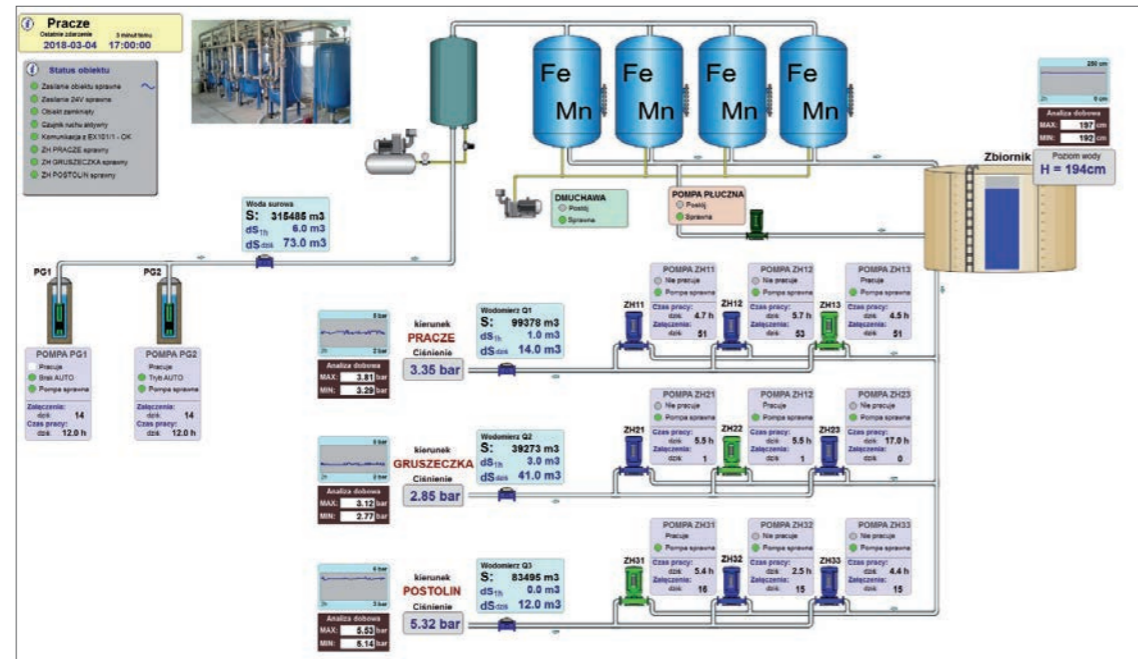
In this application, the telemetry module is powered from an AGM type battery, which requires cyclic recharging about three times/year. Thanks to the 2.6 Ah battery built-in the MT-331 module, it is possible to recharge the external battery without having to replace it with another battery during charging.



The application prepared for the user monitors not only the value of the average instantaneous flow and pressure but also informs on an ongoing basis the voltage level in the external battery as well as the estimated time for the next charging.

Below is the visualization of the same object made in a cloud application dedicated to desktop and mobile devices.



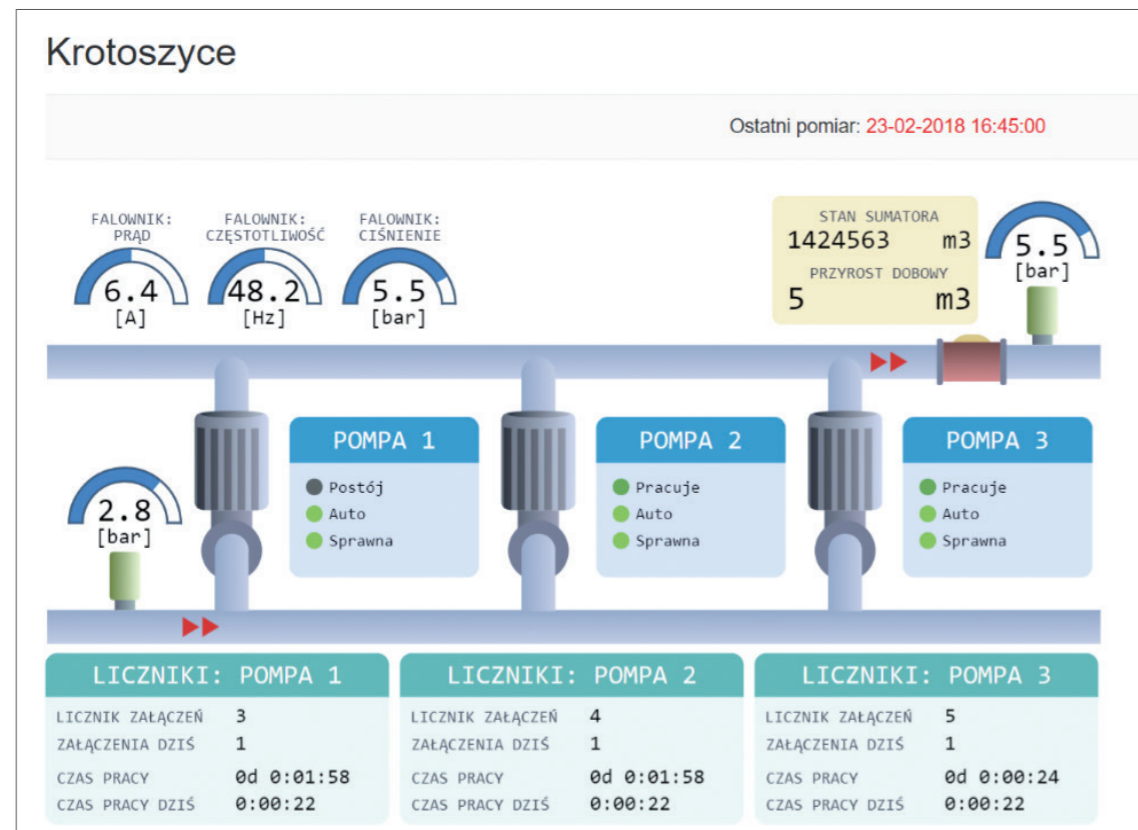


Monitoring of hydrophore sets with own PLC controllers by the MT-151 telemetry module

In 2017, the process of incorporating hydrophore sets into the visualization systems was continued. In numerous applications, CONTROL SYSTEM included objects with various equipment levels in the structures of visualization systems. MT-151 modules have proved their worth in this area of application. Thanks to the availability of RS-485 communication ports, as well as ETHERNET, it was possible in most cases to establish a digital connection with PLCs and trans-

fer data using the ModBus RTU or ModBus TCP protocols. Below is an example of the visualization of a water treatment station (WTS) containing three hydrophore sets.

To make it easier for the new user to "start the adventure" with telemetry, we offer cloud solutions that allow the implementation of visualization without building a standard dispatcher station equipped with a router.



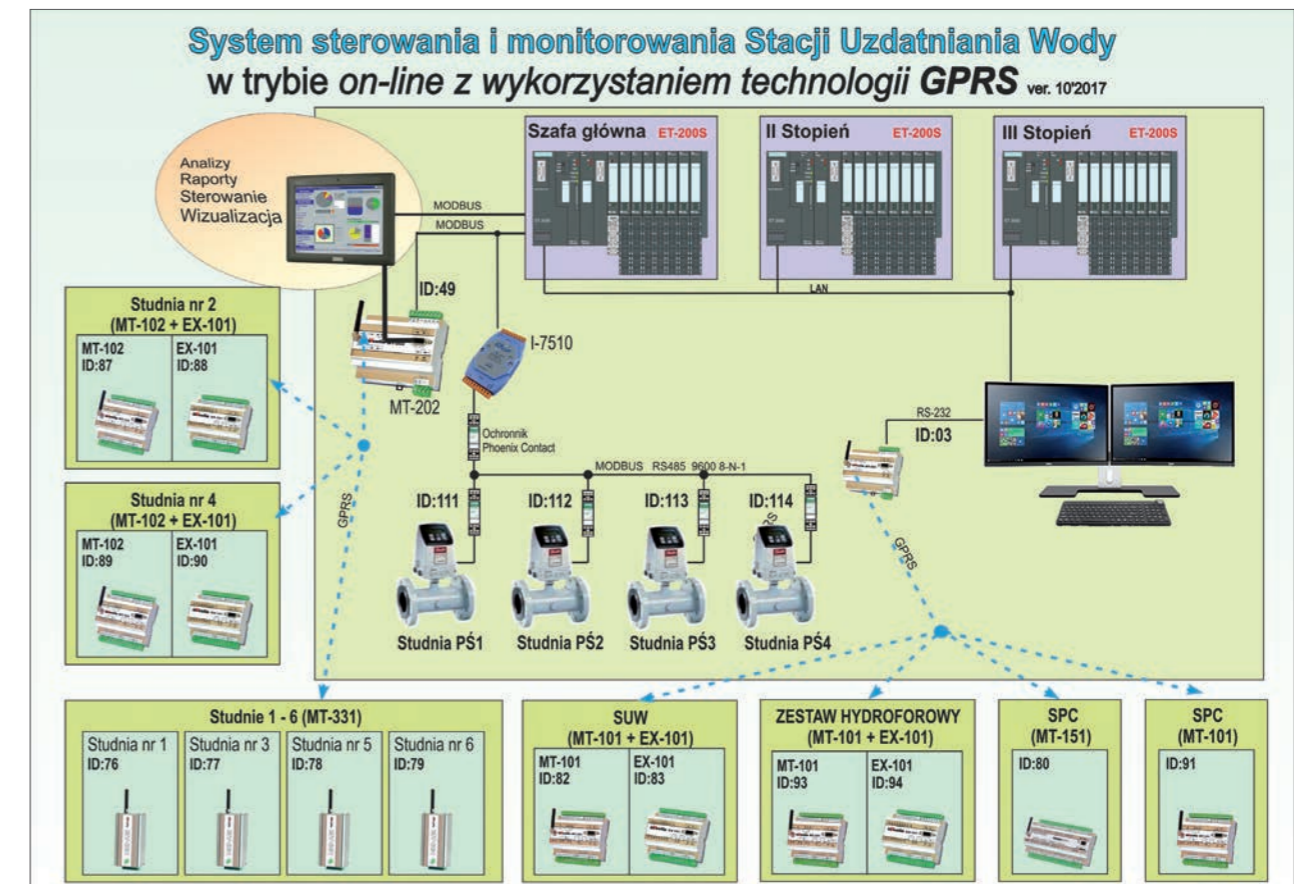
In the screenshot below is an example of the visualization of the pressure booster system equipped with the Movicon SCADA system.



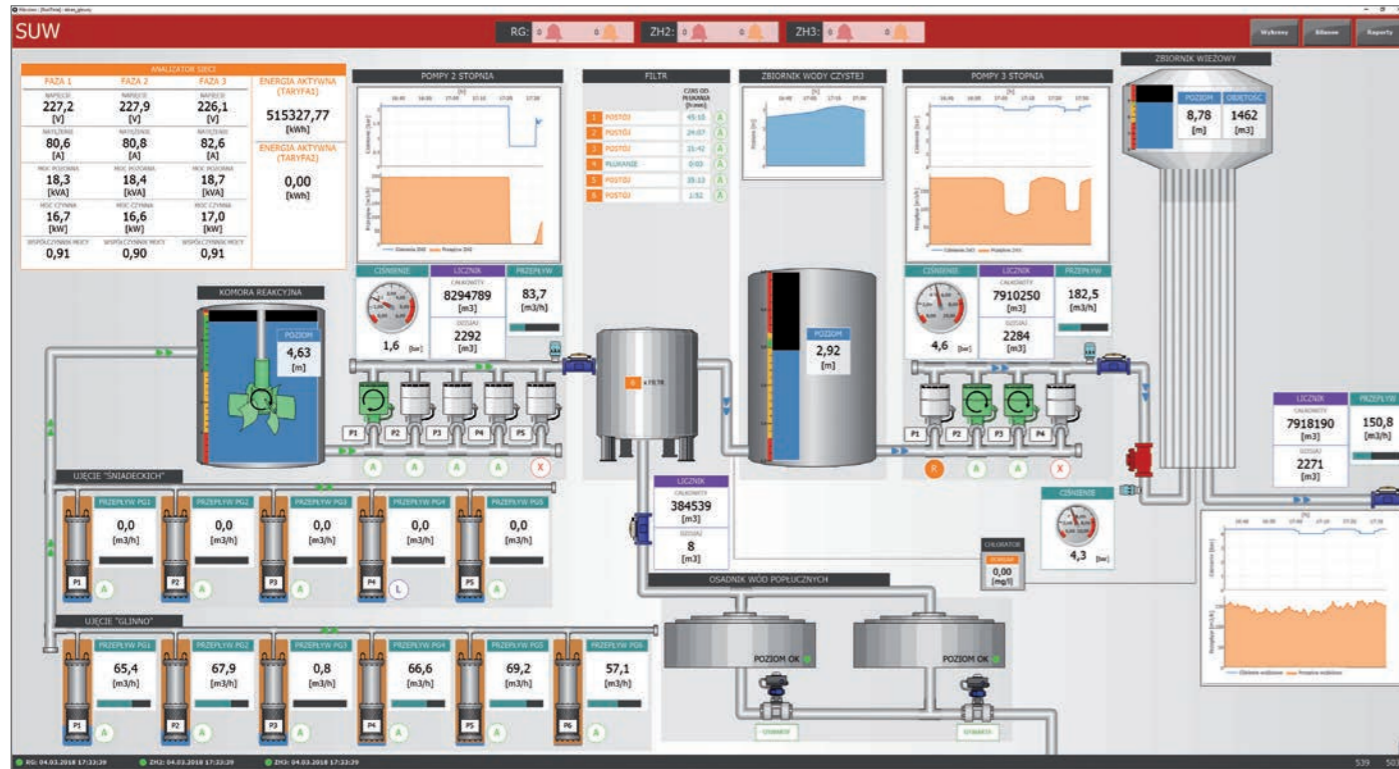
Monitoring of advanced water treatment stations based on the PROGEA Movicon SCADA system

In 2017, our team of engineers implemented extensive visualization systems based on the Movicon SCADA system. In hardware architecture, InVentia telemetry

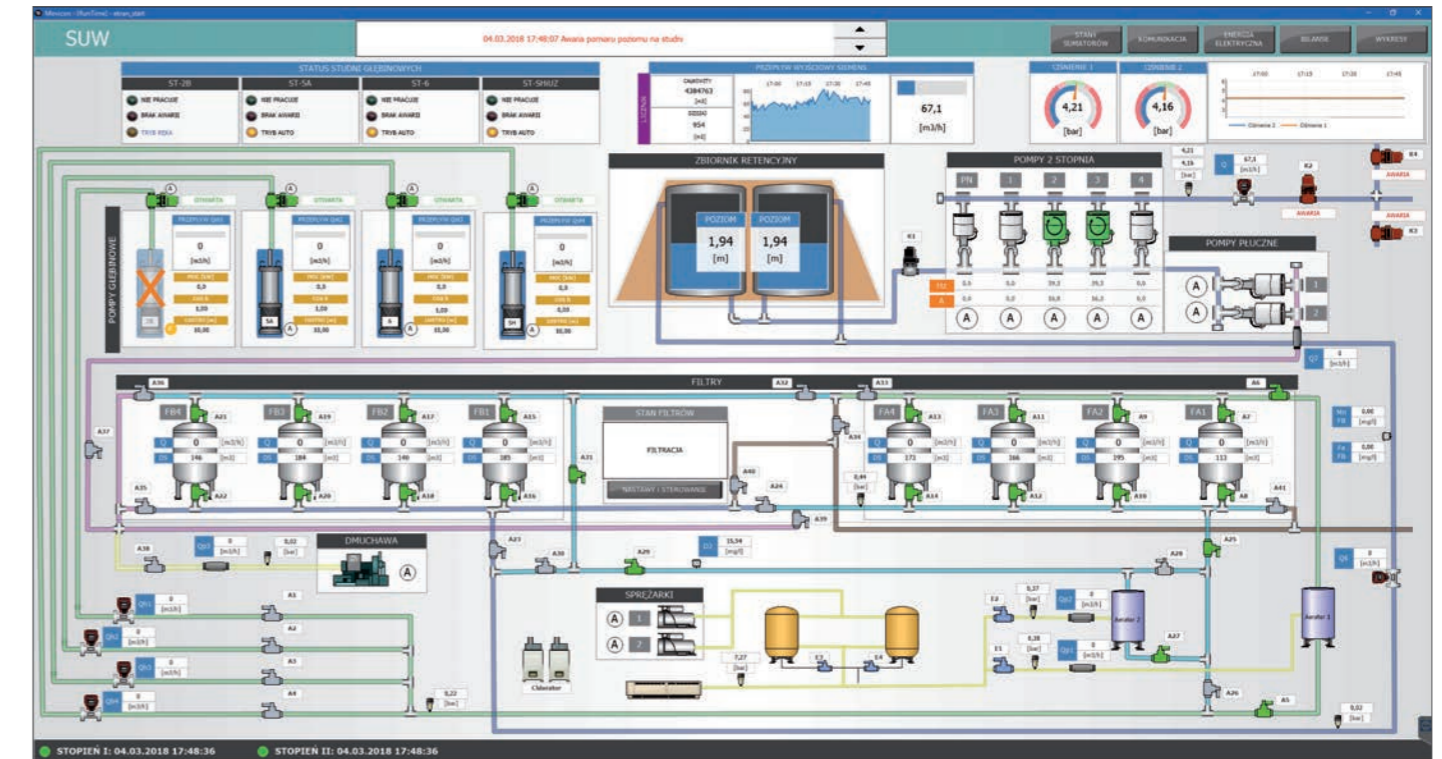
modules were also used in each of the implemented applications. The presented example confirms the extraordinary flexibility in combining, in one system, various models of telemetry modules with PLC devices.



Below is an application to visualize the described water treatment station with the Movicon SCADA system.



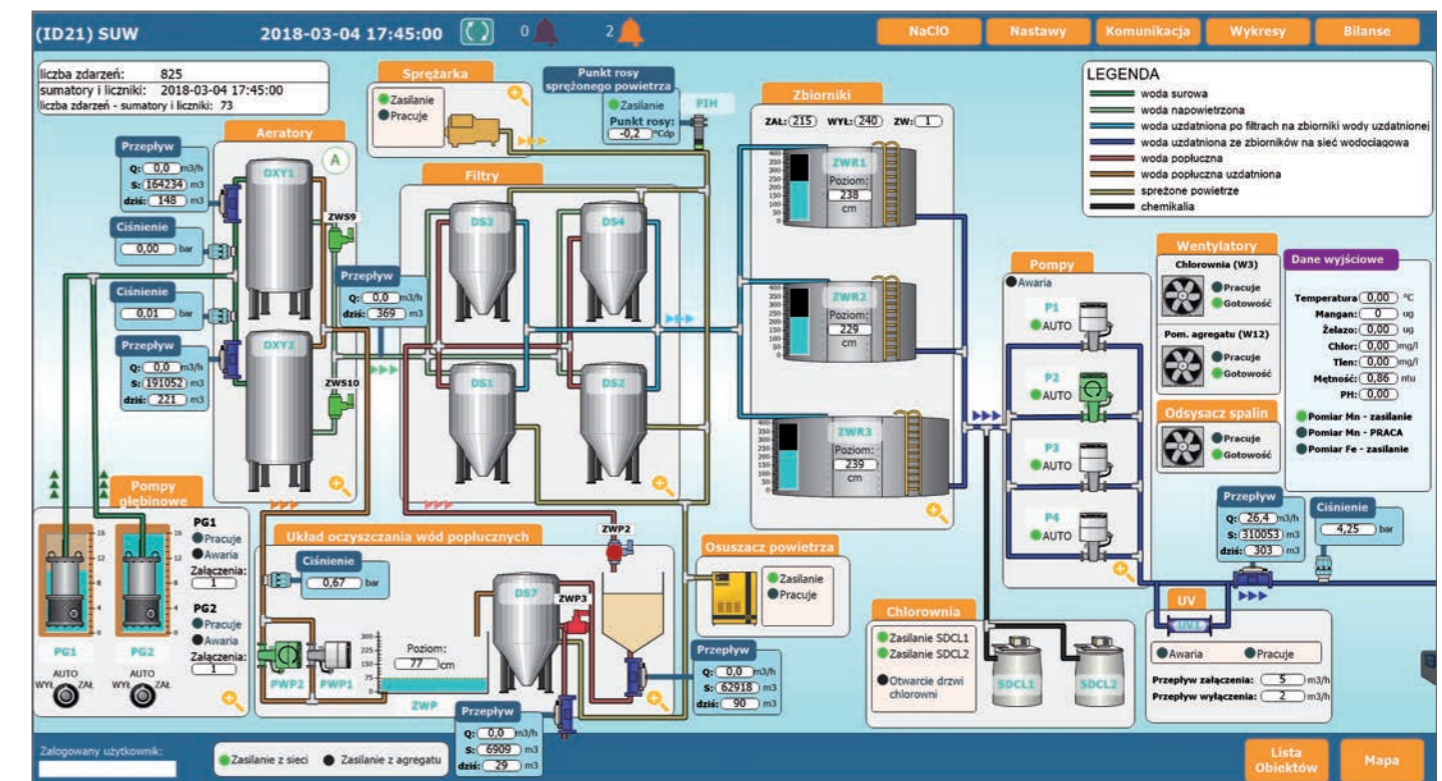
On screenshots below, we present the visualization of the next WTS.



Below, a window presenting the work of the third stage pumps in detail is shown



Below is an example of a modern visualization application with the SCADA Movicon system, a technologically advanced water treatment station. Data from the PLC controller, which is responsible for the running of the control process, is transferred to the dispatch station via the MT-151 LED module, which is connected by the ETH-ERNET bus with the PLC controller.





Track monitoring system on MT-713

Eisenbahntechnik Munder GmbH

by Dirk Munder

The track monitoring system has been developed in response to the needs of many railway infrastructure operators to quickly and economically obtain current data for existing electronic surveillance devices without the need to program complex interfaces.

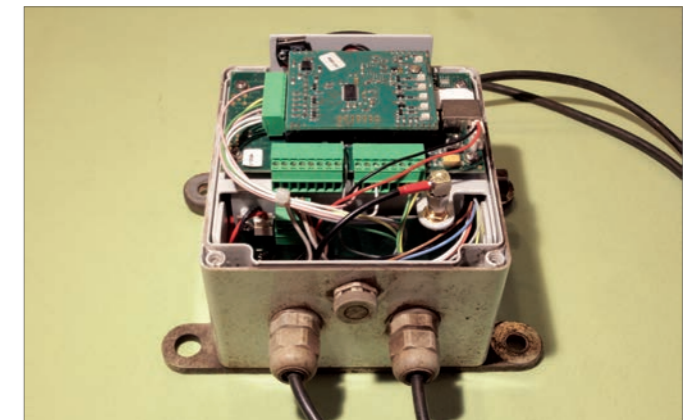
The infrastructure manager should not only know the throughput of his tracks to properly calculate the maintenance charges, but he must also have a good monitoring system to optimize maintenance activities and optimally use the potential of existing infrastructure.

The Eisenbahntechnik Munder GmbH company based in Berlin (Germany) has developed and patented a track monitoring system that perfectly solves the needs and problems of customers. The energy-saving MT-713 telemetry module manufactured by the INVENTIA was chosen as the basic element of the system. The device monitors the railway traffic through two inductive sensors connected to the track rail and communicates with the central server. The customer has the option of accessing data via the web application. At the initial stage of the concept developing, it was clear that a fully autonomous system is needed. Both the measurement section and data communication must operate on their battery power supply, and the assembly on the rails must be simple and flexible. At the same time, there was a need for much more cost-effective industrial components than those used in traditional solutions.

The MT-713 telemetry module proved to be the best available solution on the market. Additionally, the compact design of the module provides sufficient space for expansion. Less demanding modifications included replacing a standard battery pack with a lithium-ion battery and the mounting of an appropriate solar panel on the top of the set. The module can also be easily equipped with a base plate, which facilitates assembly of the device and maintenance work. However, additional modifications of internal components were necessary, including programming the firmware of the MT-713 module.

Inventia has delivered an adapted casing, which in addition to two standard cable ducts, has additional ducts for connecting a flat GSM antenna, a fuse holder, and external plug connectors. The internal mounting chamber, to which the base PCB of the module MT-713 is attached, also has the option of connecting additional electronics with a circuit for solar panel control and to supply and operate two inductive sensors that analyze the passage of the train wheels.

A particular challenge for the MT-713 telemetry module was to calculate the speed of the train that is moving on the rails. In addition to monitoring the speed limits, this information is equally important for determining the number of wagons and their types, based on the wheel layout. These advanced calculations require precise time measurement with accuracy to several microseconds. The MT-713 base PCB allows for expansion by attaching a narrow LED panel with a microcontroller, also manufactured by Inventia.



This system provides the necessary sampling frequency and enables the transfer of results via an internal connector using Modbus. It also provides basic signaling of the system operation status and allows you to quickly diagnose possible wrong states contributing to their quick elimination.

The first installations of the described track monitoring system were completed in 2013. Currently, the system works on many railway stations confirming its reliability. The system provides infrastructure managers with valuable traffic information on individual sections of railway tracks.





Control of production processes

MultiBand

by Michael Kenny

Multiband Antennas company (Dublin, Ireland), for several years, has been successfully implementing wireless telemetry systems based on leading constructions offered by INVENTIA, such as the modules of the professional series: MT-101 and MT-100.

Telemetry modules monitor various types of production processes and industrial devices, such as crushers, conveyor belts, scales or other machines used in gravel and quarry areas located throughout Europe. Production data is collected in real time and analyzed by internal user algorithms which are built based on the internal program of MT-101 and MT-100 controllers. Pre-processed data is transmitted using the GSM/GPRS network based on the SIM card with dynamic IP address to the server of the MT device manufacturer. The next step is downloading data from the server using the FTP protocol and their presentation on the website, in a dedicated system called MultiTrack.

The MT-101 telemetry controller is used in more demanding installations, where integration with external devices is desired using a serial interface and a program handling of serial port built in the MT module – the FlexSerial mode. The practical application of this mode is described in the second edition of the Telemetron magazine. We encourage you to read an article of the title "FlexSerial

Mode in practice. See how simple it is". Archive issues of the magazine are available at www.inventia.pl.

In its current form, the internal program in the MT-101 controller is prepared to download parameters from up to 6 external devices. With a one-minute interval, the MT-101 controller builds and sends an initialization frame, which forces data transmission by a slave type device. The received response is analyzed regarding sender's ID. The variables to be calculated include belt conveyor run time, number of engine starts, time of material presence on the belt and the total amount of raw material produced.

Additionally, it is possible to send information with device status on request. The phone numbers of SMS messages recipients can be changed using SMS messages sent from authorized phone numbers. If necessary, you can also remotely suspend the handling of text messages.

Our experience shows that the solutions offered by INVENTIA are of high quality. We are sure that the appropriate components were selected when designing telemetry modules, thus obtaining high product strength in harsh environmental conditions. The confirmation of this thesis is our installations, where telemetric

Machine	Time period	Production	Target production	Target reached	Monitoring hours	Laden Belt hours	Fuel consumed	Tonnes per liter	add machine add aggregation machine
RS Huntstown - Conveyor 4 (Belt Way) 150 - 0 mm dry crushed	day to date	155.00	1000.00	16%	14:57	05:09	0.00	0.00	edit delete reports Wear Parts log
	week to date	5456.00	5000.00	109%	71:55	22:16	0.00	0.00	
	month to date	7896.00	20000.00	39%	239:13	43:26	0.00	0.00	
Reset data									
RS Huntstown - Conveyor 8 (Belt Way) 0-63mm	day to date	1405.02	2000.00	70%	14:51	05:51	0.00	0.00	edit delete reports Wear Parts log
	week to date	5382.92	10000.00	54%	71:59	23:29	0.00	0.00	
	month to date	8293.82	40000.00	21%	239:57	41:02	0.00	0.00	
Reset data									
RS Huntstown GIPO Total (Belt Way) 804 dry crushed	day to date	3649.00	3500.00	104%	07:00	06:32	504.00	7.24	edit delete reports Wear Parts log
	week to date	20095.00	17500.00	115%	27:55	25:26	2739.00	7.34	
	month to date	27609.00	70000.00	39%	43:52	39:10	3840.00	7.19	
Reset data									
RS Huntstown - Conveyor 1 - Beltway 0-63mm	day to date	1498.29	2000.00	75%	15:24	05:44	0.00	0.00	edit delete reports Wear Parts log
	week to date	5732.49	10000.00	57%	71:57	22:14	0.00	0.00	
	month to date	11069.90	40000.00	28%	239:56	46:39	0.00	0.00	
Reset data									
add machine add aggregation machine									

In those installations where peripheral devices have no serial interfaces, the MT-100 telemetry module is used. A large number of binary inputs, which can be configured to work as counter inputs, are sufficient to obtain data and to internally calculate the variables of the production process that have been mentioned above.

Moreover, the telemetry modules in addition to the production parameters monitor their process variables, among which are: the back-up battery voltage level, the presence of the main power supply voltage or the login status to the GSM/GPRS network. In the event of an alarm situation, SMS messages are sent to the defined telephone numbers of service of the given facility.

modules often exposed to large temperature differences, mechanical and electrical exposures work without failure for years, ensuring comfort and satisfaction to our customers.



Comparison table of telemetry and location modules, expanders and converters

MODULE	MT-020 Telemetry Module	MT-021 Telemetry Module	MT-051 Telemetry Module	MT-100 Telemetry Module	MT-101 Telemetry Module	MT-102 Telemetry Module	MT-151 LED v2 Telemetry Module
FEATURES							
I/O Resources							
Binary inputs	0 – 4 ¹⁾	0 – 4 ¹⁾	5	8 – 16 ¹⁾	8 – 16 ¹⁾	0 – 8 ¹⁾	16 – 28 ¹⁾
Binary outputs	2	4	-	0 – 8 ¹⁾	0 – 8 ¹⁾	0 – 8 ¹⁾	0 – 12 ¹⁾
Counter inputs	0 – 4 ^{1,4)}	0 – 4 ^{1,4)}	5	8 – 16 ^{1,2)}	8 – 16 ^{1,2)}	0 – 8 ^{1,2)}	0 – 4 ¹⁾
Analog inputs	2	2	-	2	2	6	6
1-wire input	2	2	1 ⁸⁾	-	-	-	-
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES	YES
Ethernet Port	-	-	-	-	-	-	YES
Serial port RS232/422/485	-	-	-	1(1/0/0/0)	2(2/1/1/0)	2(2/1/1/0)	2(1/0/1/1) ⁸⁾
Voice channel	-	-	-	-	-	-	-
Functionality							
Local configuration via RS232/USB/ETH	-/+/-	-/+/-	-/+/-	+/-/-	+/-/-	+/-/-	-/+/+
Remote configuration over GPRS	YES	YES	YES ⁹⁾	YES	YES	YES	YES
Unsolicited messaging	YES	YES	YES	YES	YES	YES	YES
Data packet sending	YES	YES ¹⁰⁾	YES	YES	YES	YES	YES
SMS sending	YES	YES	YES	YES	YES	YES	YES
User programming (lines of code limit)	-	-	-	100	1024	1024	5000
Standard serial protocols	-	-	-	-	YES ⁵⁾	YES ⁵⁾	YES ⁵⁾
Data packet routing	-	-	-	-	YES	YES	YES
Manual alarm setting for analog inputs	-	-	-	-	YES	YES ⁷⁾	-
Number of analog input alarm levels	4	4	4	4	6	4/6	4
Remote read/write with SMS	YES	YES	YES ¹⁶⁾	YES	YES	YES	YES
Access control ⁶⁾	YES	YES	YES	YES	YES	YES	YES
Local mirroring of external resources	-	-	-	-	YES	YES	YES
Datalogger	YES ¹⁸⁾	YES ¹⁸⁾	YES	YES	YES	YES	YES
MT-DP compatibility (OPC, CSV, ODBC)	YES	YES ¹⁰⁾	YES	YES	YES	YES	YES
Remote firmware upgrade over GPRS	YES	YES ¹⁰⁾	YES	YES	YES	YES	YES
Other							
Integral GSM/GPRS modem	YES	YES	YES	YES	YES	YES	YES
SIM cards	SIM/MIM ⁸⁾	SIM	SIM/μSIM/ MIM ⁸⁾	SIM	SIM	SIM	2xSIM/MIM ⁸⁾
3G network support	YES ⁸⁾	-	-	-	-	-	YES ⁸⁾
Integral GPS receiver	-	-	-	-	-	-	-
Integrated sensor T/H/P	P ⁸⁾	-	T	-	-	-	T
DC power supply (V)/solar panel (PV)	9 – 30	9 – 30	-	9 – 30	10,8 – 36	10,8 – 36	10,8 – 30
AC power supply (Vrms)	12 – 18	-	-	-	18 – 26,4	18 – 26,4	-
Power supply for external sensors (V)	12/20	-	-	-	-	-	-
Power supply monitoring input	YES/-	YES/-	YES/-	YES/-	YES/-	YES/-	YES/-
Rechargeable battery int./ext.	ext.	-	-	-	-	-	ext.
Internal battery supply	-	-	3/6/9xR20	-	-	-	-
Low power operation modes	-	-	YES	-	-	-	-
External antenna connector	YES	YES	YES	YES	YES	YES	YES
Protection class	IP40	IP40	IP67	IP40	IP40	IP40	IP40
Operating temperature range (°C)	-20...+55	-20...+55	-20...+60	-20...+65	-20...+65	-20...+65	-20...+65
Removable terminal blocks	YES	YES	YES	YES	YES	YES	YES
DIN rail mounting	YES	YES	-	YES	YES	YES	YES
Warranty	3 years	3 years	3 years	3 years	3 years	3 years	3 years
Built-in device	-	-	-	-	-	-	-

1) number of binary inputs/outputs and counter inputs is configurable
2) fmax = 100Hz
3) fmax = 250Hz
4) fmax = 1kHz

5) Modbus RTU Master/Slave, transparent mode, other...
6) password + internal list of authorized IP and telephone numbers
7) for 2 inputs
8) option

9) requires MTSpooler
10) in new version since Q3 2012
11) if connected to MT-101/102/202
12) RS-232 to M-Bus converter
13) external battery pack required

MODULE	MT-151 HMI v2 Telemetry Module	MT-156 HMI Telemetry Module	MT-202 Telemetry Module	MT-251 Telemetry Module	MT-331 Telemetry Module	MT-512 Telemetry Module	MT-651 Telemetry Module
FEATURES							
I/O Resources							
Binary inputs	16 – 28 ¹⁾	0 – 12 ¹⁾	-	0 – 2	0 – 8 ¹⁾	8	2
Binary outputs	0 – 12 ¹⁾	0 – 12 ¹⁾	-	1	0 – 4 ¹⁾	2	2 ²²⁾
Counter inputs	0 – 4 ¹⁾	-	-	-	0 – 6 ¹⁾	8	-
Analog inputs	6	10	-	-	0 – 2 ¹⁾	-	6 ²³⁾
1-wire input	-	1	-	-	1	-	-
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES	YES
Ethernet Port	YES	YES	-	YES	-	-	-
Serial port RS232/422/485	2(1/0/1/1) ⁸⁾	3(2/0/1/0/1 ²⁵⁾)	2(2/1/1/0)	2(1/0/1/0)	-	1(1/0/1 ⁸⁾ /0)	1(0/0/1/0)
Voice channel	-	-	-	-	-	YES	-
Functionality							
Local configuration via RS232/USB/ETH	-/+/+	-/+/+	+/-/-	-/+/+	-/+/-	-/+/-	-/+/-
Remote configuration over GPRS	YES	YES	YES	YES	YES	YES	YES
Unsolicited messaging	YES	YES	YES	YES	YES	YES	YES
Data packet sending	YES	YES	YES	YES	YES	YES	YES
SMS sending	YES	YES	YES	YES	YES	YES	YES
User programming (lines of code limit)	5000	5000	1024	5000	-	-	-
Standard serial protocols	YES ⁵⁾	YES ⁵⁾	YES ⁵⁾	YES ⁵⁾	-	YES ⁸⁾	YES ⁵⁾
Data packet routing	YES	YES	YES	YES	-	-	-
Manual alarm setting for analog inputs	-	-	-	-	-	-	YES
Number of analog input alarm levels	4	4	-	-	4	-	6
Remote read/write with SMS	YES	YES	YES	YES	YES ¹⁶⁾	YES	YES
Access control ⁶⁾	YES	YES	YES	YES	YES	YES	YES
Local mirroring of external resources	YES	YES	YES	YES	-	YES	-
Datalogger	YES	YES	YES	YES	YES	YES ⁸⁾	YES
MT-DP compatibility (OPC, CSV, ODBC)	YES	YES	YES	YES	YES	YES	YES
Remote firmware upgrade over GPRS	YES	YES	YES	YES	YES	YES	YES
Other							
Integral GSM/GPRS modem	YES	YES	YES	YES	YES	YES	YES
SIM cards	2xSIM/MIM ⁸⁾	2xSIM/MIM ⁸⁾	SIM	SIM/MIM ⁸⁾	SIM/MIM ⁸⁾	SIM	2xSIM
3G network support	YES ⁸⁾	YES ⁸⁾	-	YES	YES ⁸⁾	-	YES
Integral GPS receiver	-	-	-	-	-	-	YES
Integrated sensor T/H/P	T	T	-	-	T/H ⁸⁾ /P ⁸⁾	-	T
DC power supply (V)/solar panel (PV)	10,8 – 30	10,8 – 30	10,8 – 36	18 – 55	9 – 30/PV	9 – 30	7 – 30
AC power supply (Vrms)	-	-	18 – 26,4	-	-	-	-
Power supply for external sensors (V)	-	-	-	-	7 – 24	-	-
Power supply monitoring input	YES/-	YES/-	YES/-	YES/-	YES/-	YES/-	-
Rechargeable battery int./ext.	ext.	ext.	-	ext.	int.	-	-
Internal battery supply	-	-	-	-	-	-	YES
Low power operation modes	-	-	-	-	YES	-	YES
External antenna connector	YES	YES	YES	YES	YES	YES	YES
Protection class	IP40	IP40	IP40	IP40	IP40	IP40	IP65
Operating temperature range (°C)	-20...+65	-20...+65	-20...+65	-20...+60	0...+55 ¹⁹⁾	-20...+55	-20...+55
Removable terminal blocks	YES	YES	YES	YES	YES	YES	YES
DIN rail mounting	YES	YES	YES	YES	YES	YES	YES ⁸⁾
Warranty	3 years	3 years	3 years	3 years	3 years ¹⁷⁾	3 years	3 years
Built-in device	display	display	-	-	-	-	-

14) one dedicated input for pressure measurement
15) voltage measurement, peak detector, differential measurement
16) module is not receiving SMS asleep
17) battery 1 year

18) device status recorder
19) or -20...+55°C - depending on the version of the internal battery
20) Li-Ion
21) GSM i GPS

22) Output 1 for control external bistable relay
23) 2 optoisolated groups of analog inputs: 2x10/100 V and 200 mV input with 1 μV resolution
24) dedicated cable needed
25) M-BUS

Comparison table of telemetry and location modules, expanders and converters

MODULE	MT-652 Telemetry Module	MT-713 v.2 Telemetry Module	MT-723 Telemetry Module	MT-723 PT Telemetry Module	ML-231 Location Module	ML-931 Location Module	EX-101 Expander
FEATURES							
I/O Resources							
Binary inputs	2	5	6	6	5	–	8 – 16 ¹⁾
Binary outputs	2	2	2	2	2	1	0 – 8 ¹⁾
Counter inputs	–	5 ³⁾	5 ³⁾	5 ³⁾	2 ^{1,2)}	–	8 – 16 ^{1,2)}
Analog inputs	6 ²³⁾	3	3	3 ¹⁴⁾	2 ¹⁵⁾	–	2
1-wire input	–	–	–	–	YES	–	–
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES	–
Ethernet Port	–	–	–	–	–	–	–
Serial port RS232/422/485	1(0/0/1/0)	1(0/0/1/0)	–	–	1(0/0/0/1) ⁸⁾	1(0/0/0/1) ⁸⁾	2(2/1/1/0)
Voice channel	–	–	–	–	YES ⁸⁾	–	–
Functionality							
Local configuration via RS232/USB/ETH	-/+/-	-/+/-	-/+/-	-/+/-	-/+ ²⁴⁾ /-	-/-/-	+/-/-
Remote configuration over GPRS	YES	YES ⁹⁾	YES ⁹⁾	YES ⁹⁾	YES	YES ⁹⁾	–
Unsolicited messaging	YES	YES	YES	YES	YES	YES	YES
Data packet sending	YES	YES	YES	YES	YES	YES	YES
SMS sending	YES	YES	YES	YES	YES	YES	–
User programming (lines of code limit)	–	–	–	–	–	–	1000
Standard serial protocols	YES ⁵⁾	YES ⁸⁾	–	–	YES	YES ⁸⁾	YES ¹¹⁾
Data packet routing	–	–	–	–	–	–	–
Manual alarm setting for analog inputs	YES	–	–	–	–	–	YES
Number of analog input alarm levels	6	4	4	4	4	–	6
Remote read/write with SMS	YES	YES ¹⁶⁾	YES ¹⁶⁾	YES ¹⁶⁾	YES	YES ¹⁶⁾	–
Access control ⁶⁾	YES	YES	YES	YES	YES	YES	YES
Local mirroring of external resources	–	YES	–	–	–	–	–
Datalogger	YES	YES	YES	YES	YES	YES	YES
MT-DP compatibility (OPC, CSV, ODBC)	YES	YES	YES	YES	YES	YES	YES
Remote firmware upgrade over GPRS	YES	YES	YES	YES	YES	YES	–
Other							
Integral GSM/GPRS modem	YES	YES	YES	YES	YES	YES	–
SIM cards	2xSIM	SIM/MIM ⁸⁾	SIM	SIM	SIM/MIM ⁸⁾	SIM	–
3G network support	YES	–	–	–	–	–	–
Integral GPS receiver	YES	YES ⁸⁾	YES ⁸⁾	YES ⁸⁾	YES	YES	–
Integrated sensor T/H/P	T	T	T	T	T	T	–
DC power supply (V)/solar panel (PV)	7 – 30	9 – 30 ⁸⁾	7 – 30	7 – 30	9 – 30	2 – 5	10,8 – 36
AC power supply (Vrms)	–	–	–	–	–	–	18 – 26,4
Power supply for external sensors (V)	–	0–5/15 ⁸⁾ /24 ⁸⁾	0 – 5	0 – 5	–	–	–
Power supply monitoring input	–	YES/–	YES/YES	YES/YES	YES/–	YES/YES	YES/–
Rechargeable battery int./ext.	int. ²⁰⁾	–	–	–	ext.	–	–
Internal battery supply	–	3/6xR20	1xR14 ¹³⁾	1xR14 ¹³⁾	–	YES ⁸⁾	–
Low power operation modes	YES	YES	YES	YES	YES	YES	–
External antenna connector	YES ²¹⁾	YES	YES	YES	YES	–	–
Protection class	IP65	IP67	IP68	IP68	IP40	IP54	IP40
Operating temperature range (°C)	-20...+55	-20...+55	-20...+60	-20...+60	-20...+55	-20...+55	-20...+65
Removable terminal blocks	YES	YES	–	–	–	–	YES
DIN rail mounting	YES ⁸⁾	–	–	–	–	–	YES
Warranty	3 years	3 years	3 years	3 years	3 years	3 years ⁸⁾	3 years
Built-in device	–	–	–	–	accelerometer	accelerometer	–

1) number of binary inputs/outputs and counter inputs is configurable
 2) fmax = 100Hz
 3) fmax = 250Hz
 4) fmax = 1kHz

5) Modbus RTU Master/Slave, transparent mode, other...
 6) password + internal list of authorized IP and telephone numbers
 7) for 2 inputs
 8) option

9) requires MTSpooler
 10) in new version since Q3 2012
 11) if connected to MT-101/102/202
 12) RS-232 to M-Bus converter
 13) external battery pack required

MODULE	RM-120 RS232/M-Bus Converter	MT-UPS-1 Telemetry Module	IOT-RT-01 IOT Sensor	IOT-RTH-01 IOT Sensor	IOT-RG-01 IOT Gateway	IOT-RG-02 IOT Gateway	IOT-TST-01 IOT Tester
FEATURES							
I/O Resources							
Binary inputs	–	–	–	–	–	–	–
Binary outputs	–	–	–	–	–	–	–
Counter inputs	–	–	–	–	–	–	–
Analog inputs	–	–	–	–	–	–	–
1-wire input	–	–	–	–	–	–	–
Real Time Clock (RTC)	–	–	YES	YES	–	–	YES
Ethernet Port	–	–	–	–	–	–	–
Serial port RS232/422/485	1 ¹²⁾	–	–	–	1(1/0/0/0)	1(0/0/1/0)	–
Voice channel	–	–	–	–	–	–	–
Functionality							
Local configuration via RS232/USB/ETH	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-	-/-/-
Remote configuration over GPRS	–	–	–	–	–	–	–
Unsolicited messaging	–	–	–	–	–	–	–
Data packet sending	–	–	–	–	–	–	–
SMS sending	–	–	–	–	–	–	–
User programming (lines of code limit)	–	–	–	–	–	–	–
Standard serial protocols	–	–	–	–	–	–	–
Data packet routing	–	–	–	–	–	–	–
Manual alarm setting for analog inputs	–	–	–	–	–	–	–
Number of analog input alarm levels	–	–	–	–	–	–	–
Remote read/write with SMS	–	–	–	–	–	–	–
Access control ⁶⁾	–	–	–	–	–	–	–
Local mirroring of external resources	–	–	–	–	–	–	–
Datalogger	–	–	–	–	–	–	–
MT-DP compatibility (OPC, CSV, ODBC)	–	–	–	–	–	–	–
Remote firmware upgrade over GPRS	–	–	–	–	–	–	–
Other							
Integral GSM/GPRS modem	–	–	–	–	–	–	–
SIM cards	–	–	–	–	–	–	–
3G network support	–	–	–	–	–	–	–
Integral GPS receiver	–	–	–	–	–	–	–
Integrated sensor T/H/P	–	–	T	T/H	–	–	–
DC power supply (V)/solar panel (PV)	21,6 – 42	21,6 – 42/PV	–	–	5 – 30	5 – 30	–
AC power supply (Vrms)	–	–	–	–	–	–	–
Power supply for external sensors (V)	–	–	–	–	–	–	–
Power supply monitoring input	–	–	–	–	–	–	–
Rechargeable battery int./ext.	–	ext.	–	–	–	–	int. ²⁰⁾
Internal battery supply	–	–	YES	YES	–	–	–
Low power operation modes	–	YES	YES	YES	–	–	–
External antenna connector	–	–	–	–	YES	YES	–
Protection class	IP40	IP40	IP30	IP30	IP30	IP30	IP30
Operating temperature range (°C)	-20...+55	-20...+55	-20...+60	20...+60	20...+60	20...+60	20...+60
Removable terminal blocks	YES	YES	–	–	–	–	–
DIN rail mounting	YES	YES	–	–	–	–	–
Warranty	2 years	3 years	3 years	3 years	3 years	3 years	3 years
Built-in device	–	–	–	–	–	–	–

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