

TELEMETRON

Measurement and control devices
in cathodic protection

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New programming capabilities
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Guide to
Telemetry Modules

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TELEMETRY MAGAZINE

dedicated to professional GSM/GPRS telemetry and GPS tracking solutions



inVentia



10th EDITION JUBILEE

This is the 10th anniversary issue of TELEMETRON – the telemetry magazine!



Dear Readers,

This is the tenth edition of the telemetry magazine that we present to you. We are honoured to have been able to provide you for so many years with new information about professional telemetry and tracking solutions based on GSM/GPRS/3G/4G and GPS mobile technology. We hope for another successful decade with TELEMETRON magazine!

On the occasion of the jubilee edition of the magazine and the 16th anniversary of INVENTIA President Jerzy Białousz shares with you his reflections about the history of the company's development.

We encourage you to read the articles dedicated to the new MT-651 and MT-652 telemetry modules that entered the market last year as a response to the demand from the gas industry. In this issue we have also included a description of new capabilities in MOBICON® series programming and new features in the communication of these modules with M-Bus devices. The IoT (Internet of Things) family of telemetry modules, which is a group of wireless sensors based on the LoRa radio technology, as well as the new TK500 routers produced by Welotec Company, are Inventia's new offerings.

We would like to thank Mr. Jarosław Strojcecki from AB-MICRO, the company which was the precursor of our telemetry solutions, for his article on predictive maintenance in transformer stations, a process based on temperature monitoring by means of the MT-151 HMI module. Many thanks also to Mr. Maciej Sawicki, who has described the use of advanced functionality of a new generation of telemetry modules in applications developed and implemented by Control System last year, and Mr. Maciej Malicki for his article about the use of the new modules in cathodic protection.

In this issue we also publish two articles by our foreign partners: ICH from Mexico, which has used telemetry modules for remote monitoring and control of drinking water intakes, and Pipeguard from Sweden, which has implemented a telemetry system for monitoring district heating pipelines in China's first plant generating heat with the use of environmentally-friendly solutions.

In this issue you will find specification sheets for Inventia's all telemetry and tracking modules, which are colour-coded into different application groups. The comparison table placed at the end of the magazine makes it easy to find a device with the resources and capabilities that best suit your needs.

Have a fruitful read!

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in this issue:

<p>Dedicated telemetry modules in cathodic protection</p> <p>Cathodic protection (CP) is an electrochemical method of corrosion protection that can be applied to any steel objects / structures buried in the ground or submerged in water. Cathodic protection is referred to as active protection ...</p>		<p>More information on page 54.</p>
<p>Telemetry modules in Middle Kingdom (China), Pipeguard</p> <p>The Swedish company PG Monitoring System AB, with years of experience in monitoring district heating networks in the domestic market, has been using Inventia's telemetry solutions for many years. ...</p>		<p>More information on page 86.</p>

INVENTIA Ltd. Short description of activity



Inventia awarded the Forbes Diamond 2017 title – the Polish edition of the magazine confirms Inventia's position among the best companies on the Polish market!

INVENTIA Ltd. 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 20 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

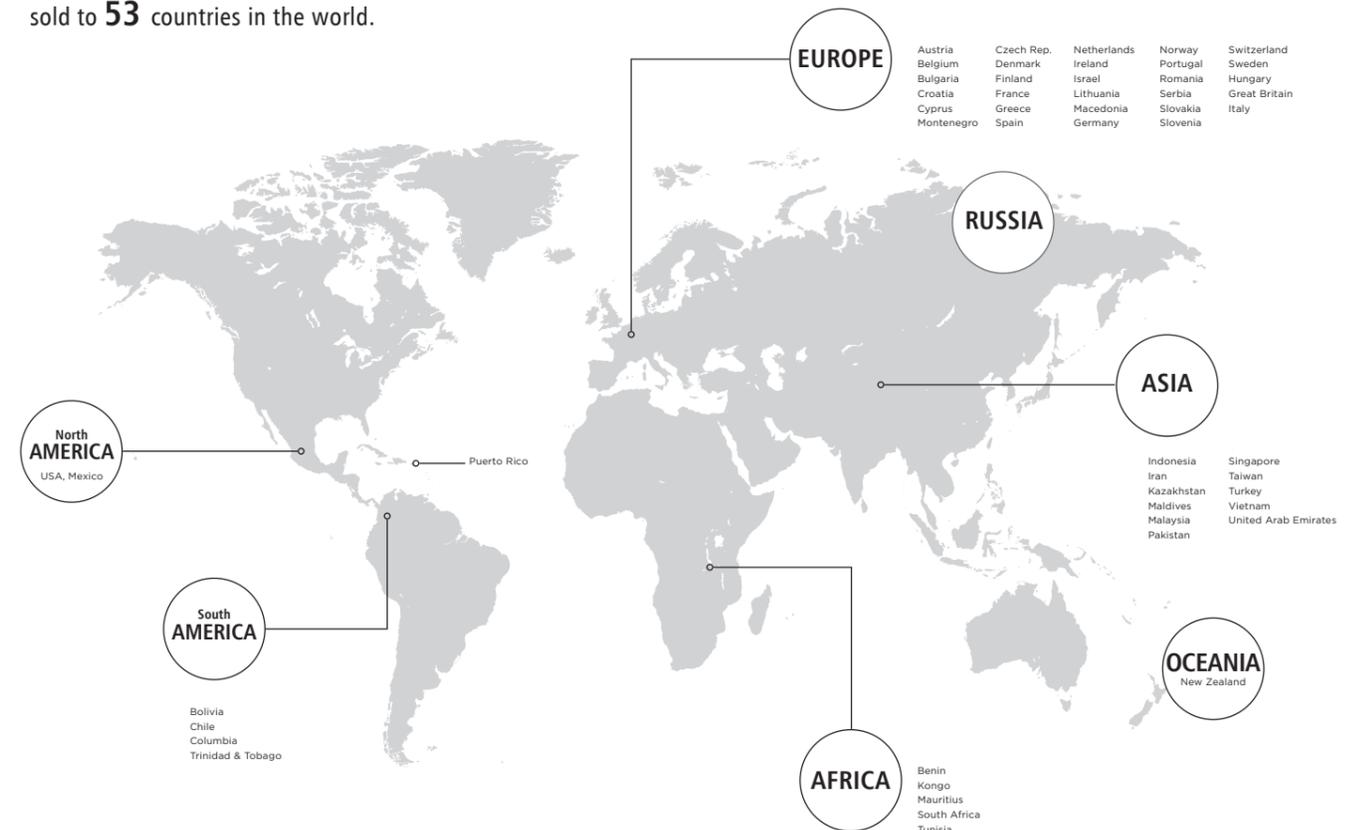
AUTOMATICON 2016 Fair



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.

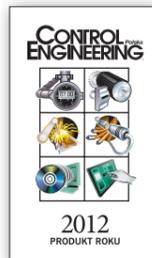
are becoming the world standard for professional telemetry solutions and remote location. MT series telemetry modules have been awarded with prestigious prizes in Poland – Gold Medal of the AUTOMATICON Fair, Grand Prix of the WOD-KAN Fair, and PRODUCT OF THE YEAR 2012 of Control Engineering Poland.

Our references cover over **80 000** telemetry and vehicle tracking modules sold to **53** 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 80,000 telemetry and locating devices working in Poland and 53 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: 2008 Quality Management System.





We are presenting you the 10th jubilee edition of Telemetron magazine. Each edition describes the subsequent year of our work, thousands of modules working at our Customers' sites and on new markets.

When we started our telemetry adventure in early 2001, trust in wireless technology was very low as wireless Internet access was in its infancy and there was a lack of available solutions for the professional market. Today the situation looks quite different. Over the past 16 years, our solutions have earned many loyal users around the world (more than 80,000 devices!) solving problems of remote maintenance of unmanned systems that are often not so easy. Parallel to the already known packet data transmission using GPRS, other faster technologies began to emerge. The speed of data transfer for the not-too-wide band of telemetry transmission did not matter, but influenced the availability of the transmission channel which in the case of GPRS is frequently occupied by voice calls. Current technologies provide not only fast and reliable data transfer, but also the ability to simultaneously log thousands of devices to a single BTS. Our products keep up with the evolution of GSM data transfer technology, fulfilling the real needs and expectations

of the users first. All our products, starting with the first MT-101 and ending with the latest MT-151 devices, were built with attention to automation standards and using the latest achievements of the GSM. Also our new series of modules, applicable in district heating systems or cathodic protection, are based on years of experience, guaranteeing consistency with our other products. If we talk about development, it is impossible not to mention the battery powered modules, intended for collecting relatively small amounts of data, but with the expected multi-year working lifetime with one set of batteries. This requires a significant reduction in the amount of power consumed by the module both at idle state and during transmission, and therefore we are increasingly paying attention to the low-power, low-bandwidth technologies such as NB-IoT or near-distance, unlicensed LoRa. Linking energy-efficient unlicensed solutions with licensed GSM ones gives us the freedom to shape topologies of systems and reduce the cost of their use while improving the lifetime of battery powered devices. This is an important element because, although we have more and more efficient wireless data transmission systems, there is still a long road to the wireless powering of telemetry objects ...

Jerzy Białousz

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 88-91 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 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, MT-151 LED
	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	DI / DO	Specifies the number of discrete inputs and outputs of the device
	Device with e-mails sending ability	AI	Specifies the number of analogue inputs of the device
	Device with ability of data transmission via a second generation networks		Device with programmable logic
3G	Device with built-in 3G modem		Device with a data logger
	Device with built-in GPS receiver		Module with an enhanced IP class
RS - 232 RS - 485	Device with RS-232 or RS-422/485 port		An energy efficient or energy-saving device
	Device with Ethernet port		Device with galvanic isolation circuits
	Device with MIM card		Mounting on DIN rail
	Device supporting two SIM cards (Dual SIM)		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

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	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

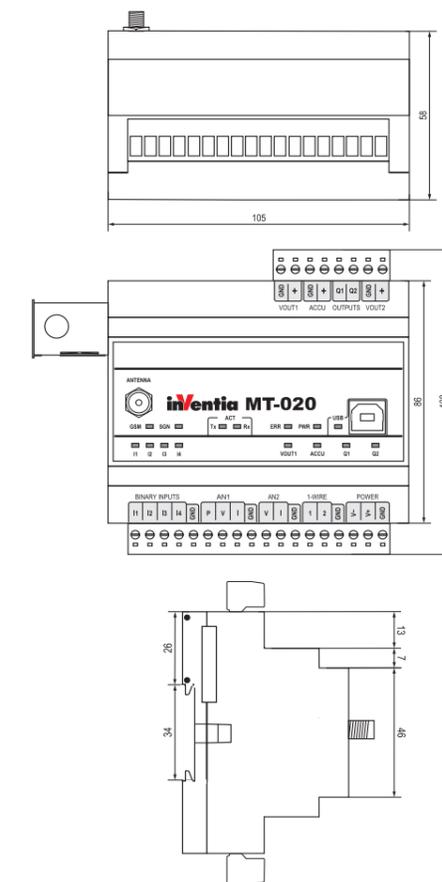
Power output VOUT1 (stabilized)

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

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 do +55 °C
Accuracy	±1 °C (depending on used sensor)

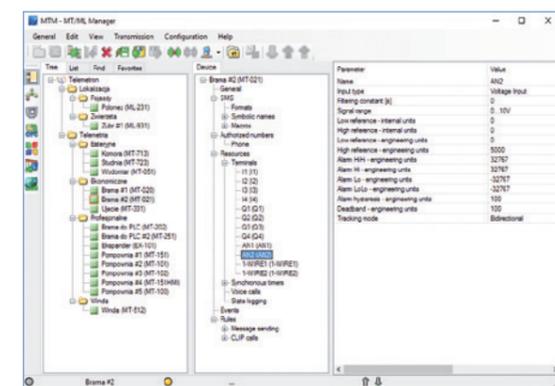
Analog inputs AN1, AN2 – voltage measurement

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.

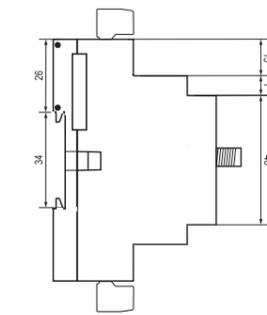
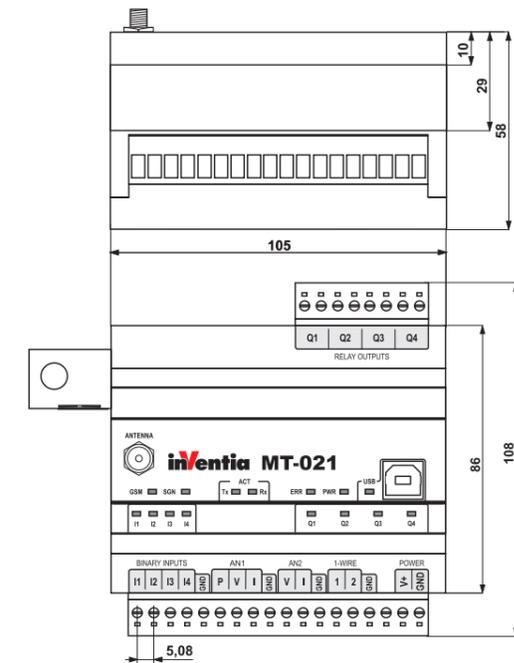
Analog inputs AN1, AN2 – current measurement

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

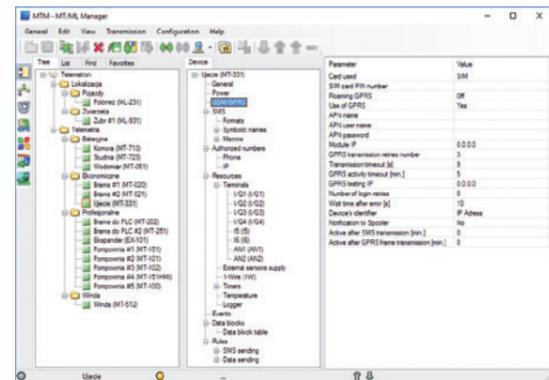
Binary inputs I7 – I8

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

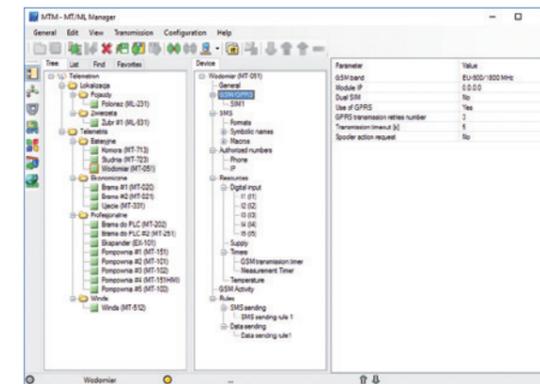
Logger

Memory type	FLASH
Capacity in records	28000

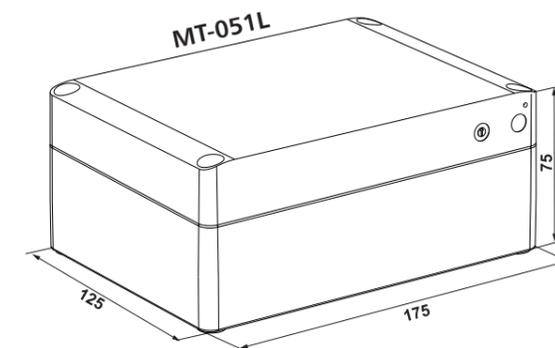
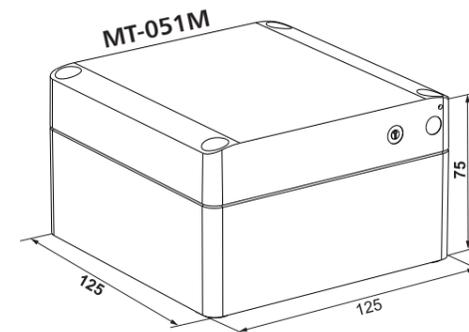
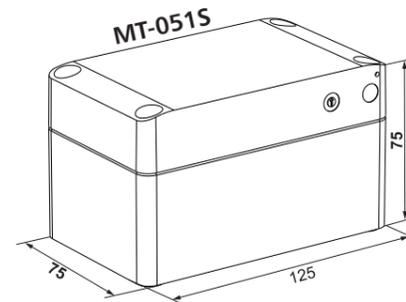
Additional features

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)



5DI/0DO



MT-051

MT-051

MT-713 – 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 (4MB 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
- 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

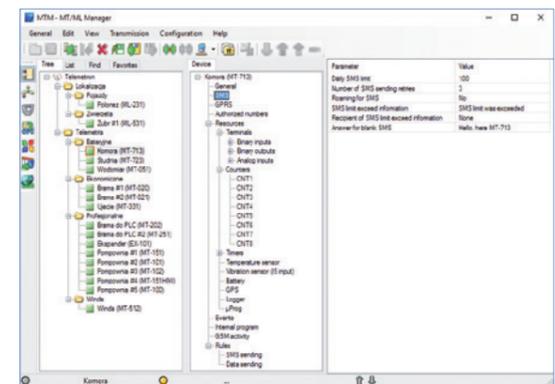
Configurable voltage output

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

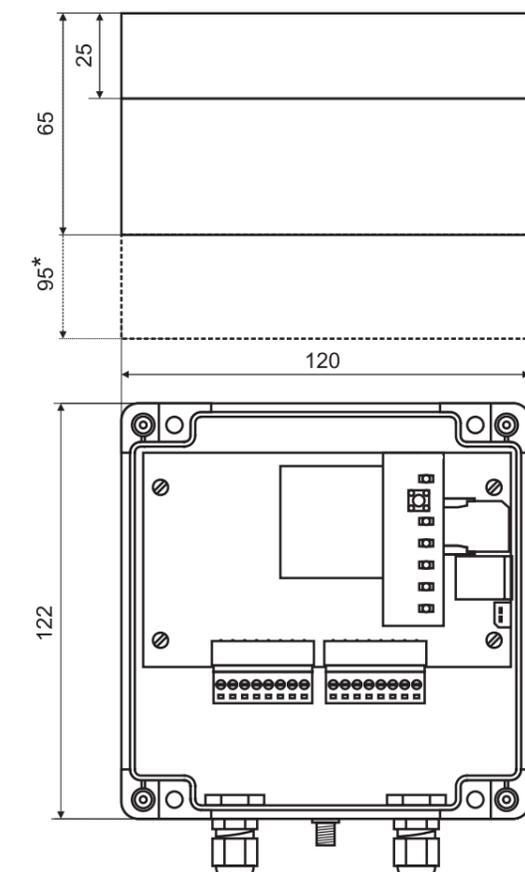
Logger

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

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



5DI/2DO

3AI



RS-485 option

MT-713

MT-713

MT-713 v.2 – Battery powered, energy saving GPRS telemetry module

- Transmisja 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

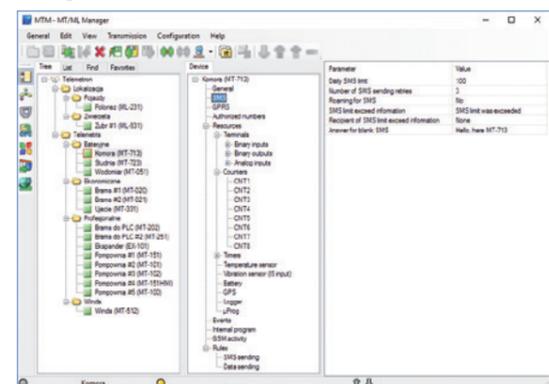
Configurable voltage output

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

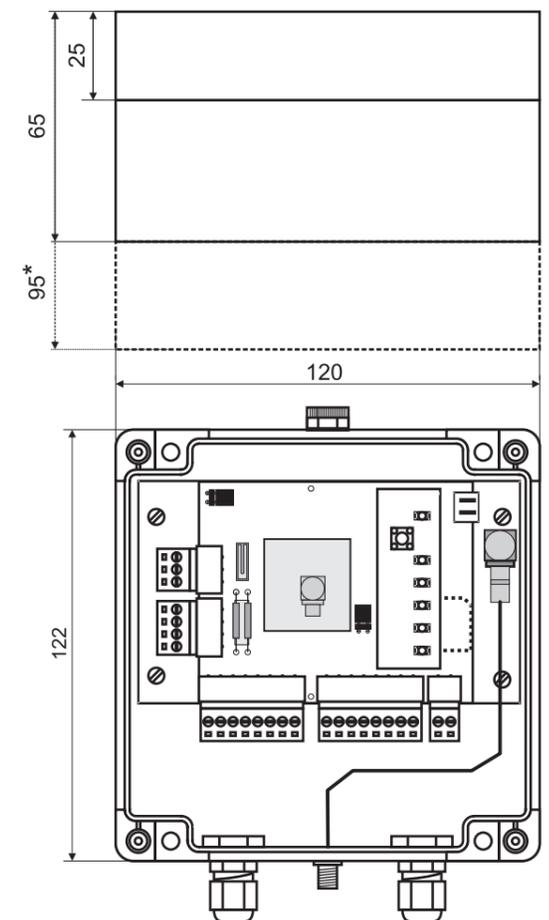
Logger

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

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-713 v.2



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 +55°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 +55°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 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

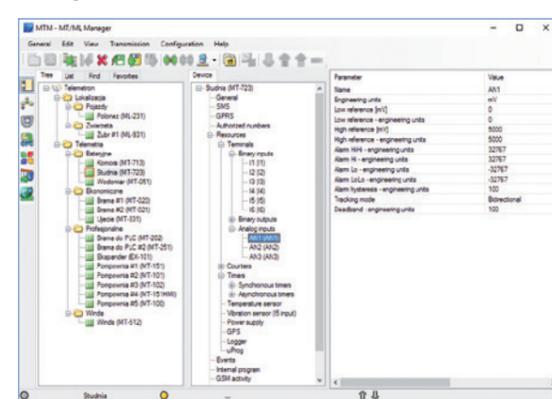
Logger

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

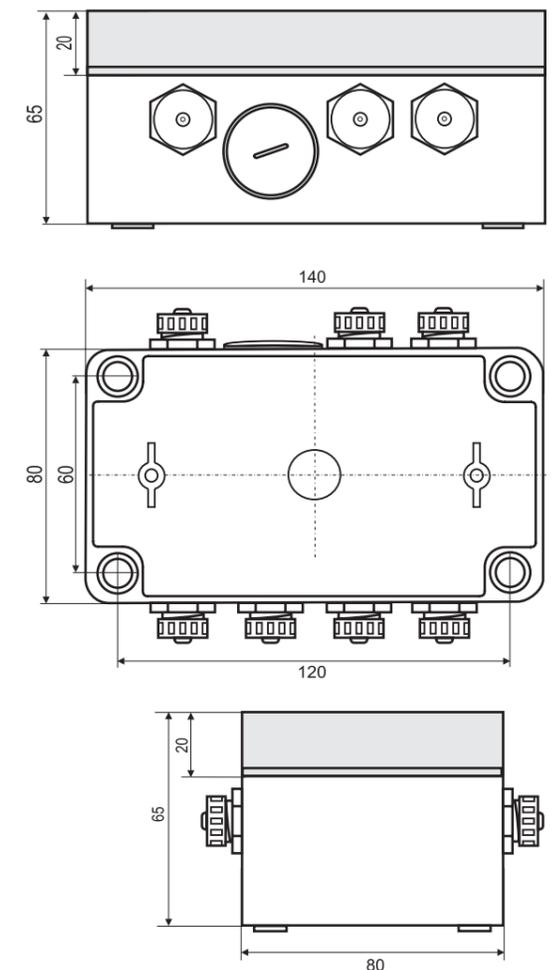
Configurable voltage output

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)



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 +55 °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 +55 °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

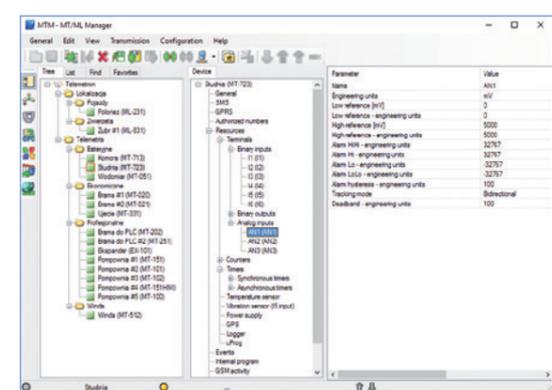
Configurable voltage output

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

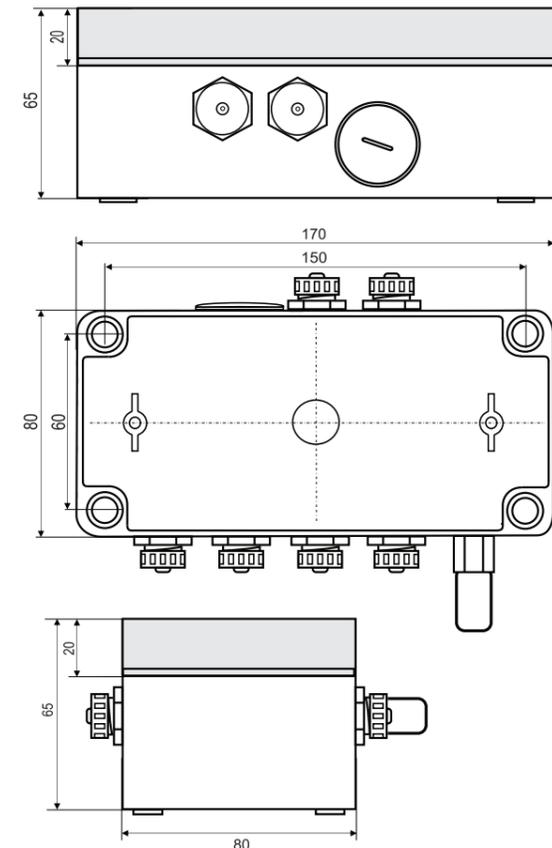
Logger

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

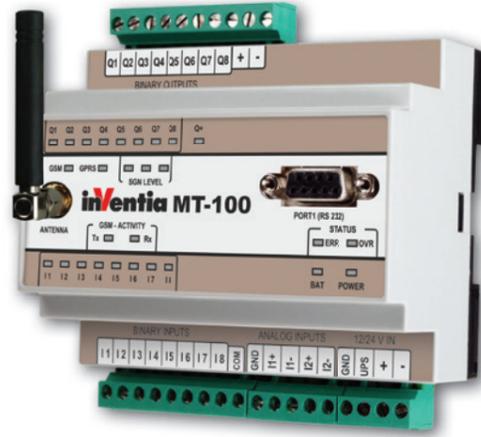


MT-723 PT

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



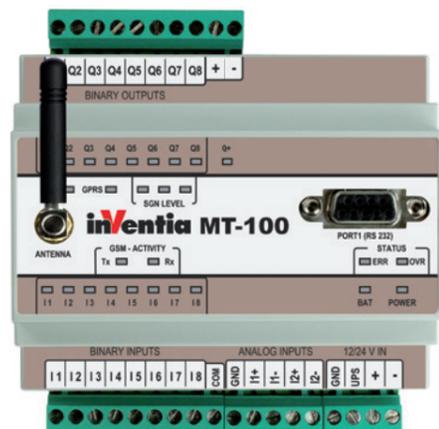
MT-100 module offers ultimate price/feature ratio. It has the same, known for high quality, input/output resources as MT-101. It lacks only the communication port and buttons for manual setting alarm thresholds. PLC functionality allows creating programs up to 100 lines of code. With price set at the 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 0,07	Active 0,40	Max 1,90
Input current (A) (for 24 V DC)	Idle 0,04	Active 0,18	Max 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.

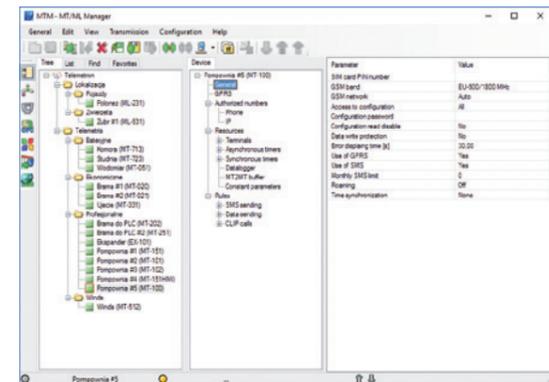
Outputs Q1 – Q8

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

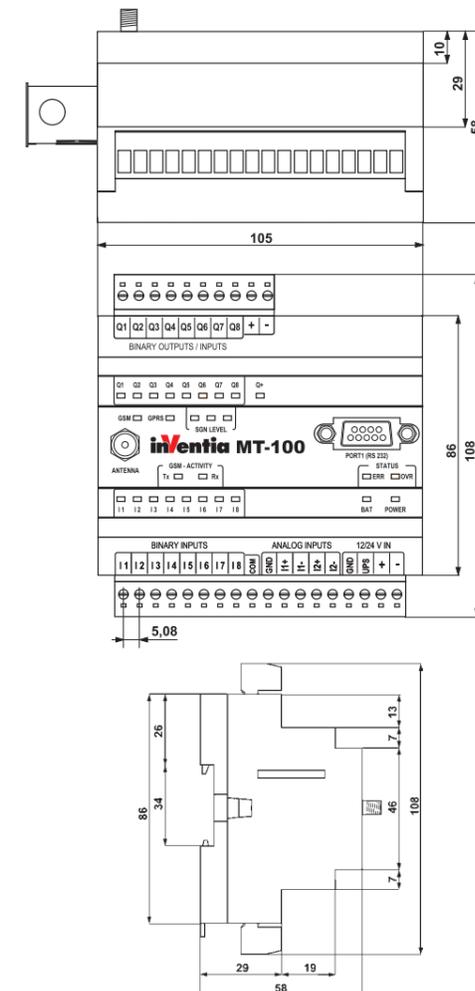
Analog inputs AN1, AN2 (4–20 mA)

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

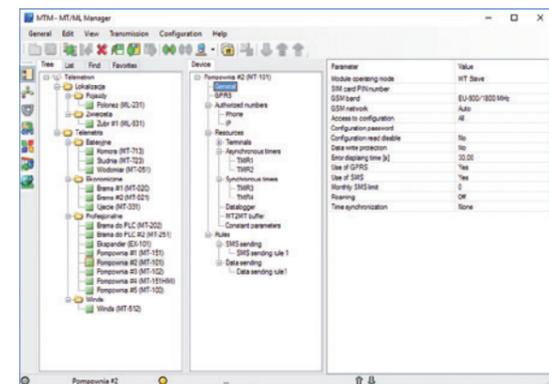
Outputs Q1 – Q8

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

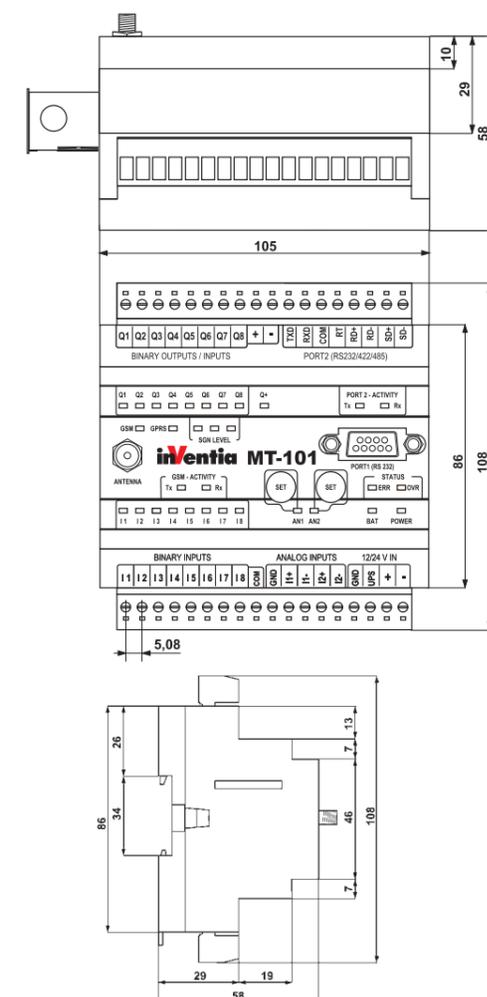
Analog inputs AN1, AN2 (4 – 20 mA)

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

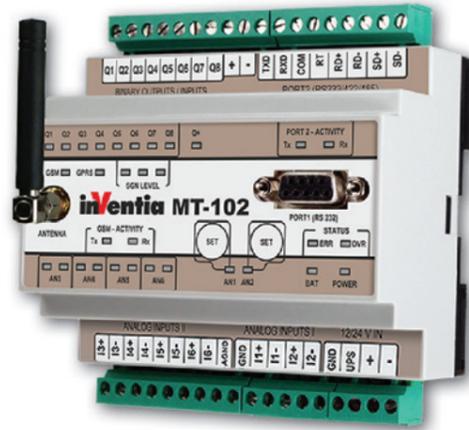
RS-232/422/485

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
Input current (A) (for 24V DC)	Idle	Active	Max
	0,06	0,25	1,00

Inputs Q1 – Q8

Input voltage range	36 V
Input resistance	5,4 kΩ tzp.
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

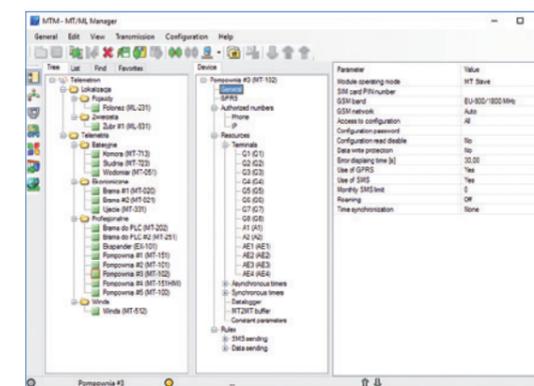
Analog inputs AN1, AN2 (4 – 20 mA)

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

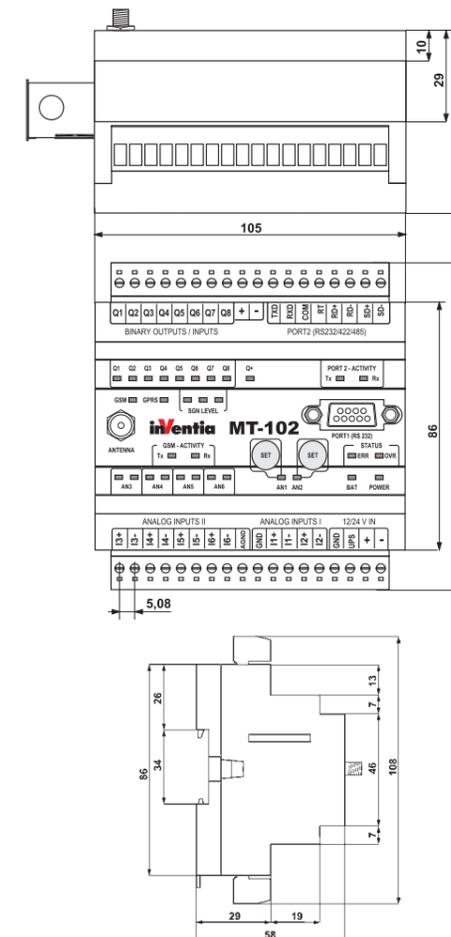
Analog inputs AN3 – AN6 (4 – 20 mA)

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



RS-232

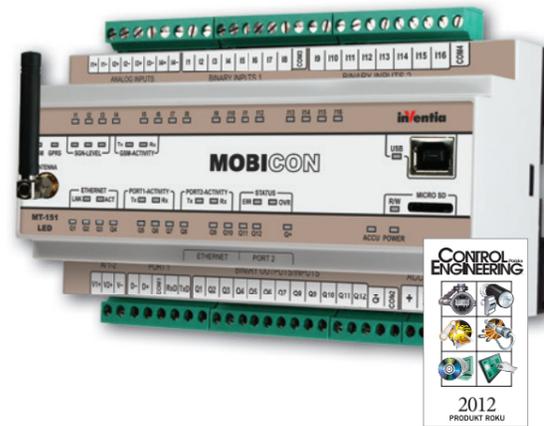
RS-232/422/485

MT-102

MT-102

MT-151 LED – MOBICON Mobile Controller for GSM/GPRS telemetry

- GSM/GPRS packet transmission
- Integral quad-band modem GSM 850/900/1800/1900
- Dual-SIM technology – 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
- 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 (micro SD card support)
- Programmable logic controller (PLC)
- Standard communication protocols (MODBUS RTU, MODBUS TCP, M-BUS, NMEA 0183)
- FlexSerial – programmable handling of non-standard serial protocols
- Remote configuration, programming, diagnostics and firmware upgrade via GPRS



MOBICON is a family of new generation telemetry controllers for demanding tasks and applications. MT-151 LED model is a professional, industrial design combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network. Dual-SIM technology ensures superior level of GSM network availability, with redundant channel of data transmission. Ethernet port provides powerful capabilities of integration with other devices and systems of the user. 48 diagnostic LEDs announce clearly detailed information about actual status and operation of the module. With compact, robust design, integral GSM modem, attractive technical features and easy to use configuration tools the MT-151 LED controller is an optimal solution for demanding wireless telemetry, control, diagnostic, surveillance and alarm systems.

Resources

- 16 optoisolated binary/counter inputs 12/24 VDC (I1 – I16), positive and negative logic
- 12 optoisolated binary outputs 12/24 VDC (Q1 – Q12), positive logic – selectively configurable as inputs
- 4 optoisolated, differential analog inputs 4 – 20 mA (accuracy 0,2%, 14-bit resolution @ 1 sec interval) with configurable hysteresis and filtration
- 2 single-ended analog inputs 0 – 10 V
- Ethernet port 10Base-T/100Base-TX
- Isolated RS-232/485 serial port
- RS-232 serial port with 5 V / 500 mA feeding
- USB port for local configuration and programming
- Interface for backup 12 V SLA battery – charging support
- 2 SIM holders – Dual-SIM support

- 48 status LEDs (I/O states, successful login to GSM network, active GPRS session, GSM signal level, RX and TX activity of GSM modem, RX and TX activity of communication ports, operations on micro SD card, module status, primary and backup power source)
- Internal flags and registers for user application program
- Firmware Flash memory with remote update capability
- Data and Event logger supporting micro SD card
- RTC with external synchronization functions

Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
- Access to module resources using standard protocols MODBUS RTU and MODBUS TCP
- Intelligent packet routing and Multimaster support in MODBUS mode
- Programmable control logic using I/Os, timers, counters, flags and registers for triggering events (data transmission/recording, SMS transmission, e-mail transmission, setting outputs and internal registers, making calls, etc.)
- Event based transmission (unsolicited messaging) triggered by change of binary input state, internal flag state, by reaching alarm level of analog input, by true condition.
- Configurable SMS messages triggered by alarms and scheduled
- Dynamic fields in SMS text
- Configurable alarm levels, hysteresis, deadband and filtration for analog inputs
- Data and event recording on micro SD card with 0,1 s resolution

- 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
- SNMP support
- 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

General

Dimensions (L x W x H)	157 x 86 x 58 mm
Weight	450 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40

GSM/GPRS Modem

Modem type	Cinterion TC63i
GSM	QuadBand (GSM 850/EGSM 900/DCS 1800/PCS 1900)
Output power GSM850/EGSM900	33 dBm (2W) - class 4 station
Output power DCS1800/PCS1900	30 dBm (1W) - class 1 station
GPRS class	10
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50 Ω

Inputs I1 – I16

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 – 3 V

Inputs Q1 – Q12

Input voltage range	36 V
Input resistance	5,4 kΩ typ.
Input voltage ON (1)	>9 V
Input voltage OFF (0)	<3 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 – 36 V		
Input current (@ 24 VDC)	Idle 0,06 A	Active 0,25 A	Max. 1,00 A

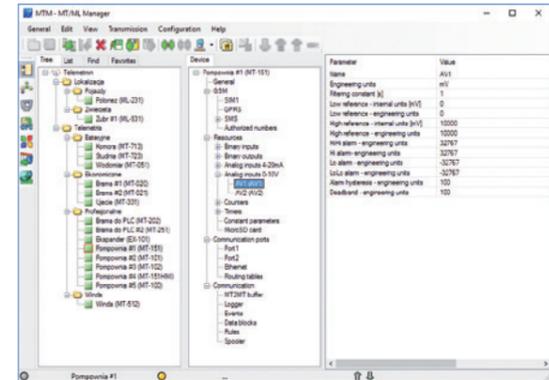
Analog inputs 4 – 20 mA (4)

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 %

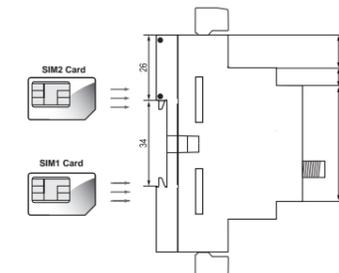
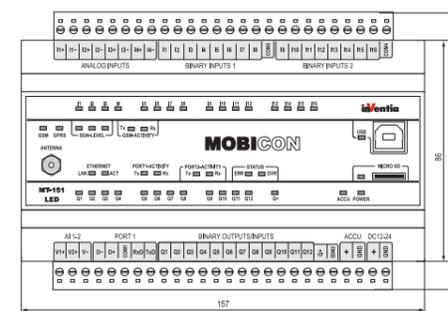
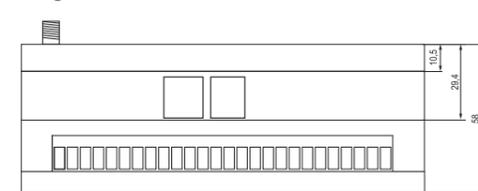
Analog inputs 0 – 10 V (2)

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 %

Configuration environment



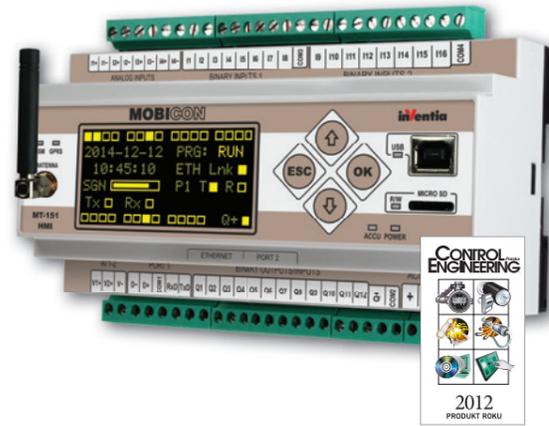
Drawings and dimensions (all dimensions in millimeters)



MT-151 LED

MT-151 HMI – MOBICON Mobile Controller for GSM/GPRS telemetry

- GSM/GPRS packet transmission
- Integral quad-band modem GSM 850/900/1800/1900
- Dual-SIM technology – 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
- 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, NMEA 0183)
- FlexSerial – programmable handling of non-standard serial protocols
- Remote configuration, programming, diagnostics and firmware upgrade via GPRS



MOBICON is a family of new generation telemetry controllers for demanding tasks and applications. MT-151 HMI model is a professional, industrial design combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network. **Dual-SIM technology** ensures superior level of GSM network availability, providing redundant channel of data transmission. Ethernet port provides powerful capabilities of integration with other devices and systems of the user. **Graphic display** is a convenient user interface for local diagnostics, supervision and monitoring – without use of external operator panel or portable PC. With compact, robust design, integral GSM modem, attractive technical features and easy to use configuration tools the MT-151 HMI controller is an optimal solution for demanding wireless telemetry, control, diagnostic, surveillance and alarm systems.

Resources

- 16 optoisolated binary/counter inputs 12/24 VDC (I1 – I16), positive and negative logic
- 12 optoisolated binary outputs 12/24 VDC (Q1 – Q12), positive logic – selectively configurable as inputs
- 4 optoisolated analog inputs 4 – 20 mA (accuracy 0,2%, 14-bit resolution @ 1 sec interval) with configurable hysteresis and filtration
- 2 analog inputs 0-10 V
- Ethernet port 10Base-T/100Base-TX
- Isolated RS-232/485 serial port
- RS-232 serial port with 5 V / 500 mA feeding
- USB port for local configuration and programming
- Interface for backup 12 V SLA battery – charging support
- 2 SIM holders – Dual-SIM support

- OLED graphic display (128x64) and status LEDs
- Internal flags and registers for user application program
- Firmware Flash memory with remote update capability
- Data and Event logger supporting micro SD card
- RTC with external synchronization functions

Functionality

- Transmission modes:
 - GPRS - packet transmission
 - SMS
- Access to module resources using standard protocols MODBUS RTU and MODBUS TCP
- Intelligent packet routing and Multimaster support in MODBUS mode
- Programmable control logic using I/Os, timers, counters, flags and registers for triggering events (data transmission/recording, SMS transmission, e-mail transmission, setting outputs and internal registers, making calls, etc.)
- Event based transmission (unsolicited messaging) triggered by change of binary input state, internal flag state, by reaching alarm level of analog input, by true condition.
- Configurable SMS messages triggered by alarms and scheduled
- Dynamic fields in SMS text
- Configurable alarm levels, hysteresis, deadband and filtration for analog inputs
- Data and event recording on micro SD card with 0,1 sec resolution
- 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
- 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

General

Dimensions (L x W x H)	157 x 86 x 58 mm
Weight	450 g
Fixing	DIN Rail 35 mm
Operating temperature	-20 to +65 °C
Operating humidity	up to 95% noncondensing
Protection class	IP40

GSM/GPRS Modem

Modem type	Cinterion TC63i
GSM	QuadBand (GSM 850/EGSM 900/DCS 1800/PCS 1900)
Output power GSM850/EGSM900	33 dBm (2W) - class 4 station
Output power DCS1800/PCS1900	30 dBm (1W) - class 1 station
GPRS class	10
Modulation	0,3 GMSK
Channel spacing	200 kHz
Antenna	50 Ω

Inputs I1 – I16

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 – 3 V

Inputs Q1 – Q12

Input voltage range	36 V
Input resistance	5,4 kΩ typ.
Input voltage ON (1)	>9 V
Input voltage OFF (0)	<3 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 – 36 V		
Input current (@ 24 VDC)	Idle	Active	Max.
	0,06 A	0,25 A	1,00 A

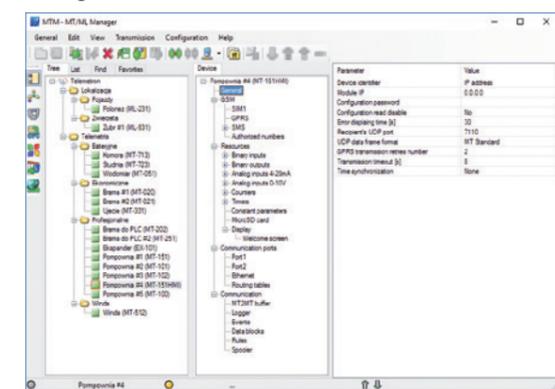
Analog inputs 4 – 20 mA (4)

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 %

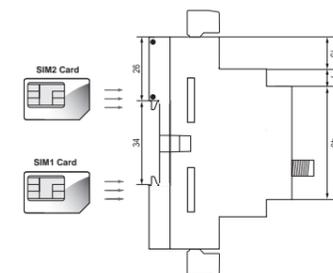
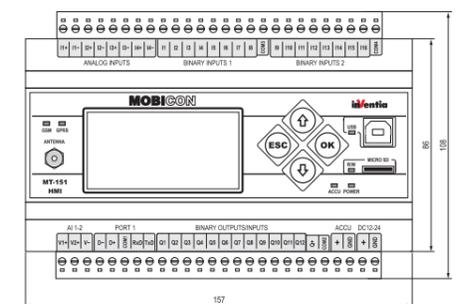
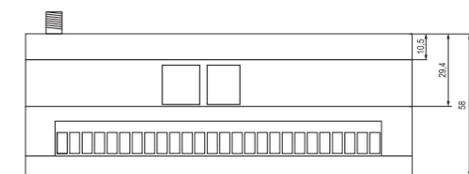
Analog inputs 0 – 10 V (2)

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 %

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



MT-151 HMI



16-28DI /12DO

6AI



DIN RAIL

RS-232

RS-232/485

3G option



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.

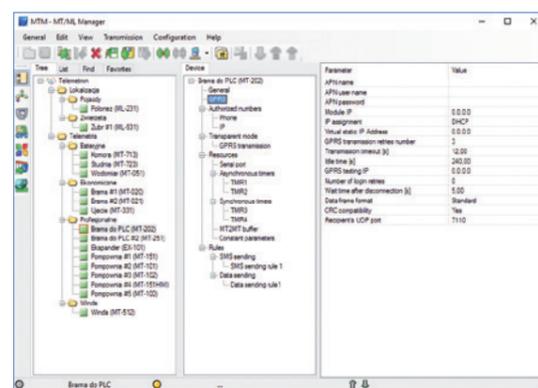
Power supply

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

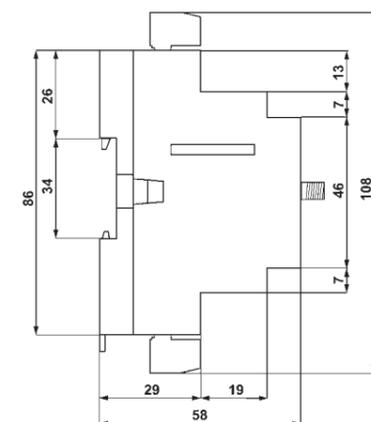
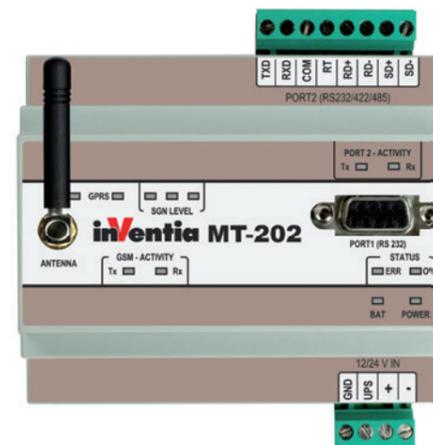
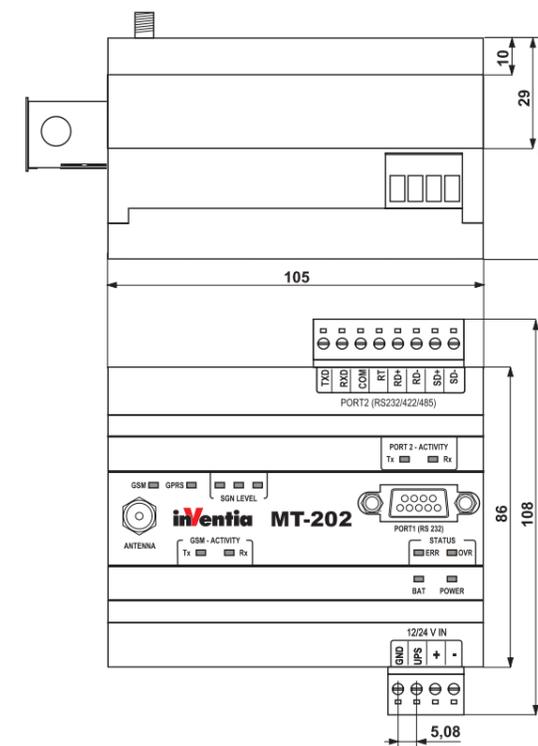
GSM/GPRS Modem

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)



WARRANTY 3 YEARS



DIN RAIL

RS-232

RS-232/422/485

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

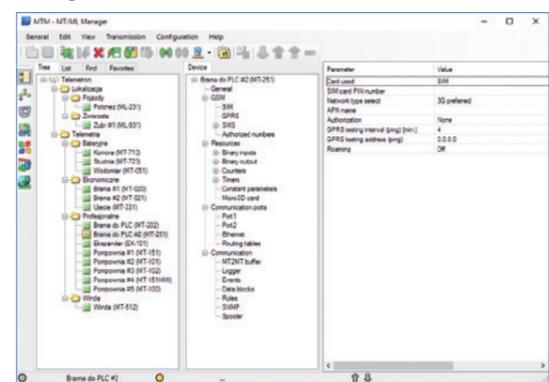
Operating in binary input mode:

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.

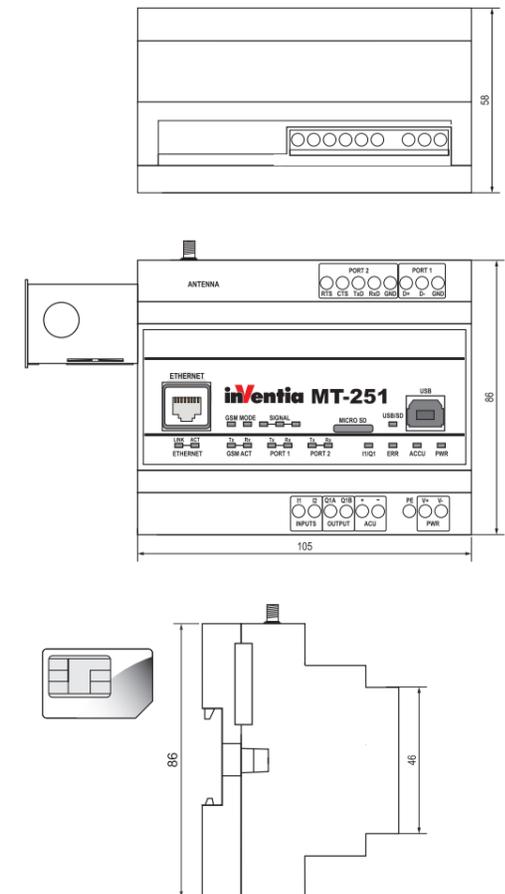
Binary output Q1:

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 (I)	> 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

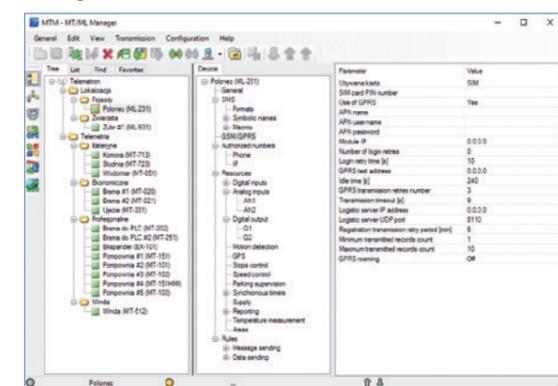
Measurement range	0 – 10 V*
Input Resistance	200 kΩ
A / D converter	12 bits

* with the possibility to increase the scope

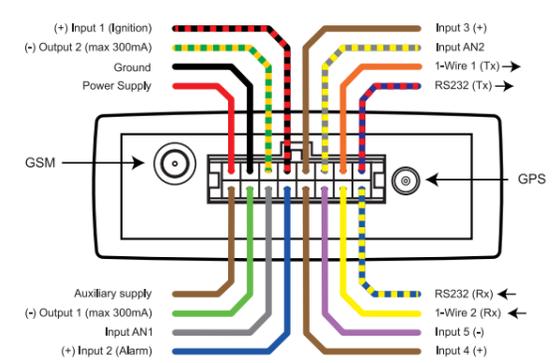
Serial ports

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

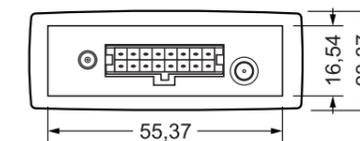
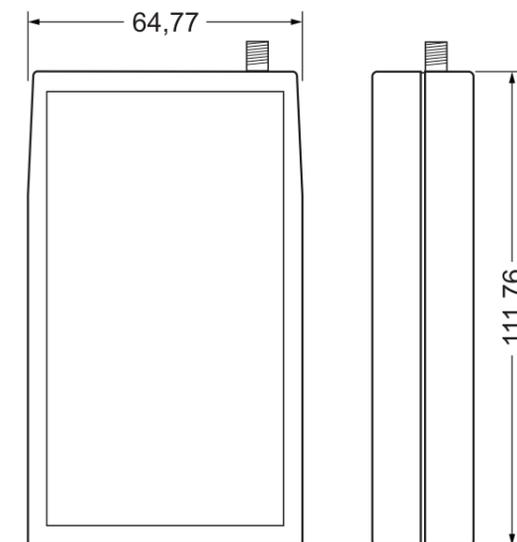
Configuration environment



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 localization 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 localization module GPS/GPRS

- Specialized module for localization 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 localization 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 localization 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)

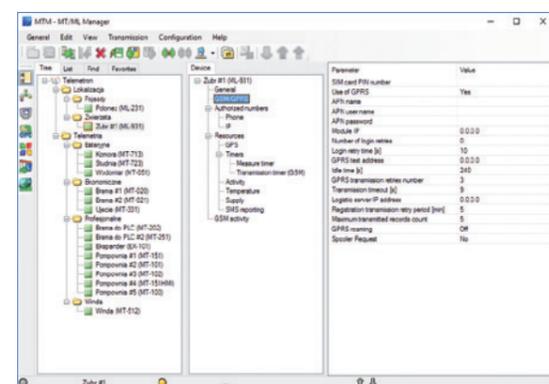
Binary output/power supply

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)

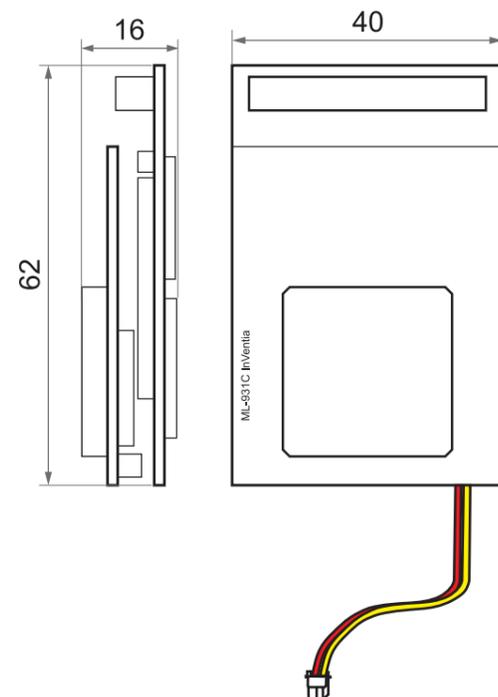
Serial ports

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

Configuration environment



Drawings and dimensions (all dimensions in millimeters)



ML-931

ML-931

MT-512 – Specjalizowany moduł alarmowy dla wind

- Transmisja 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

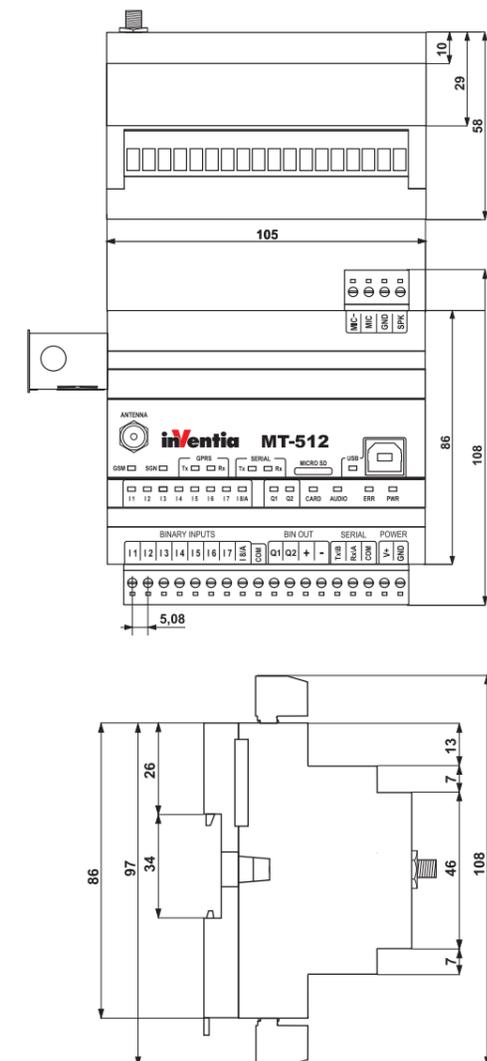
Inputs I1 – ALARM/I8

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

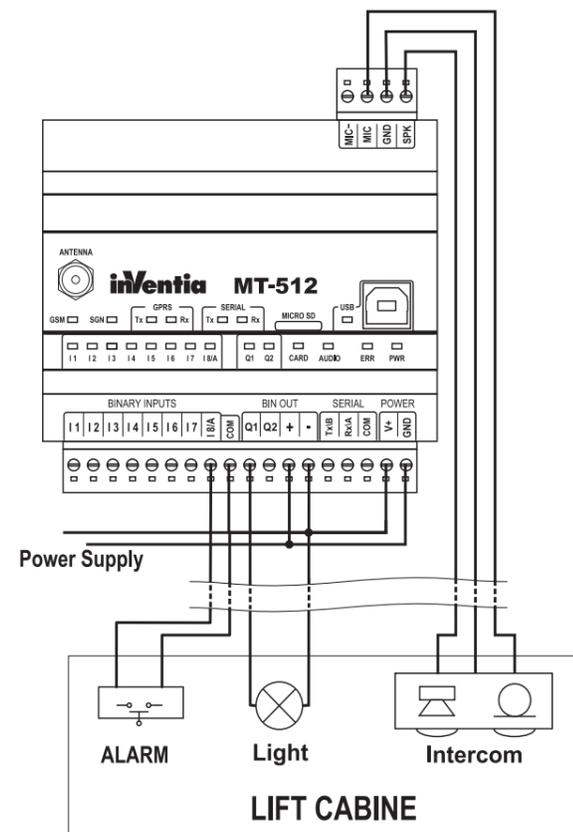
Outputs Q1,Q2

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



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

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



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



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

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 range:	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 2 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

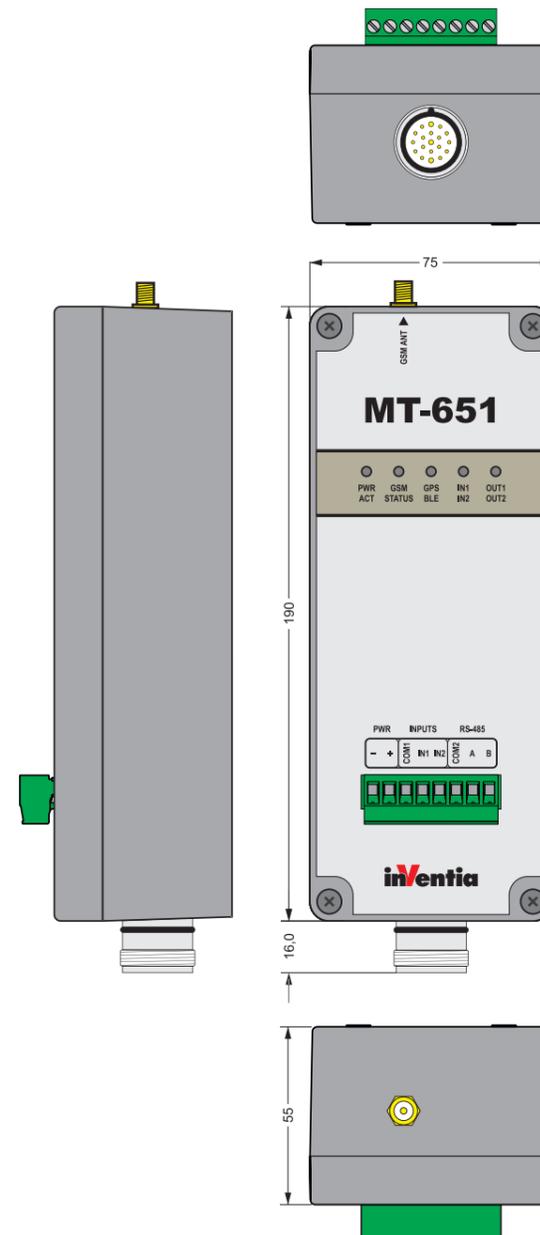
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* 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

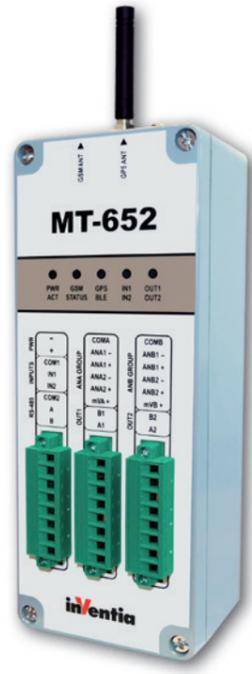
Drawings and dimensions (all dimensions in millimeters)



MT-651

MT-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



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

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 2 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

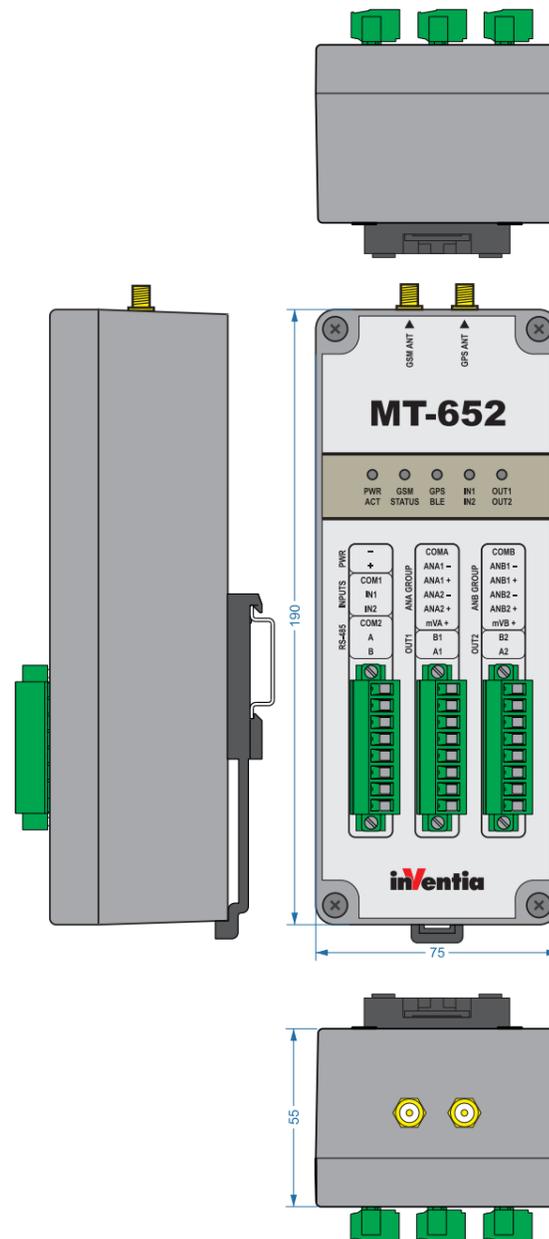
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* 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

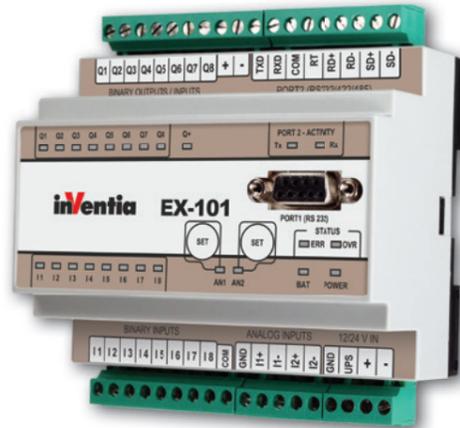


RS-485



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.

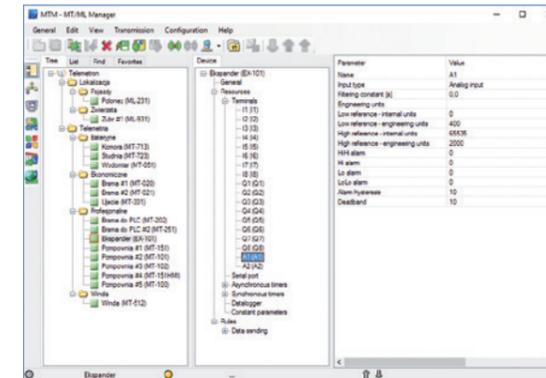
Outputs Q1 – Q8

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.

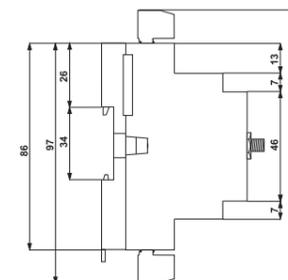
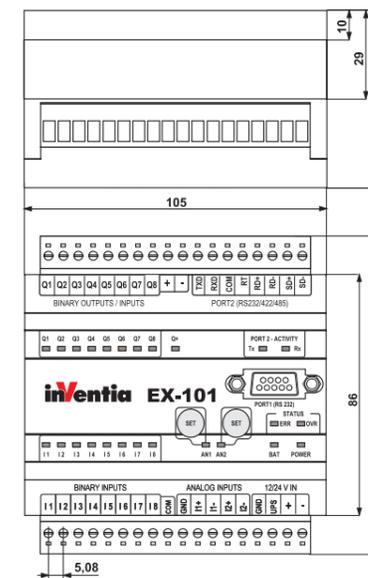
Analog inputs A1, A2 (4 – 20 mA)

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 the 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 a local control program allows the EX-101 module to be used as a freely programmable PLC.

Functionality

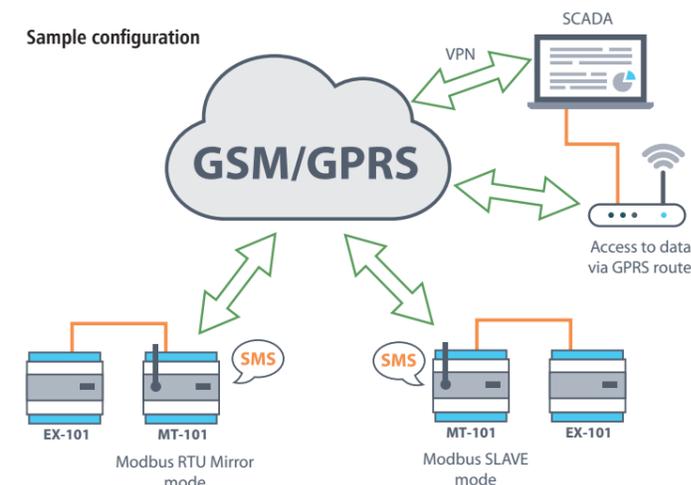
- All binary inputs can be configured as counters or frequency-to-analog converters (0-2kHz)
- Programmable control functions using I/O's and configurable, event triggered flags (data logging, output control)
- Unsolicited messaging
- Event triggered Data Logger
- Simple, multipoint alarm configuration 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 used like a 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



WARRANTY 3 YEARS



PLC

8-16DI / 0-8DO

2AI



DIN RAIL

RS-232

RS-232/422/485

EX-101

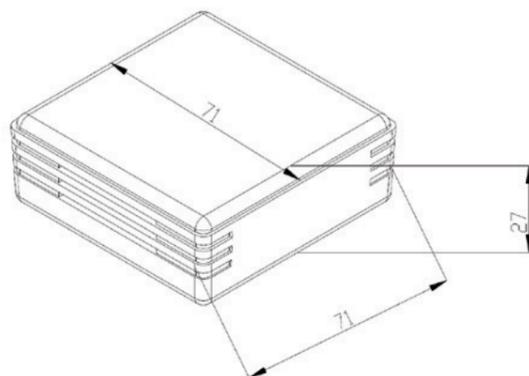
EX-101

- 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



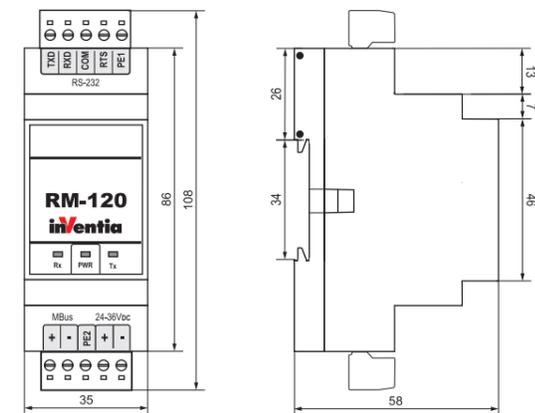
The RM-120 converter module is used in installations where it is necessary to read object parameters from devices that support M-Bus communication (electricity and heat meters, PLCs). The MT-101 or MT-202 telemetry module provides wireless communication with distributed M-Bus nodes using packet-switched 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



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.

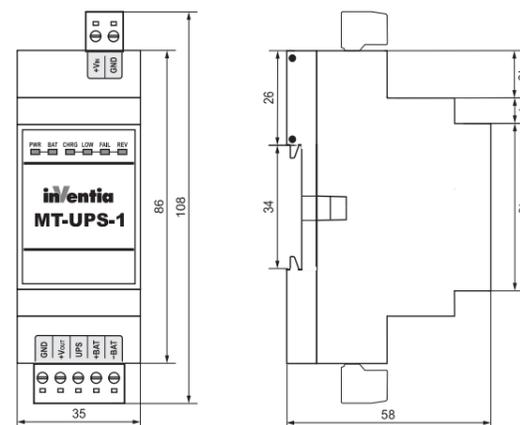
Functionality

- 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

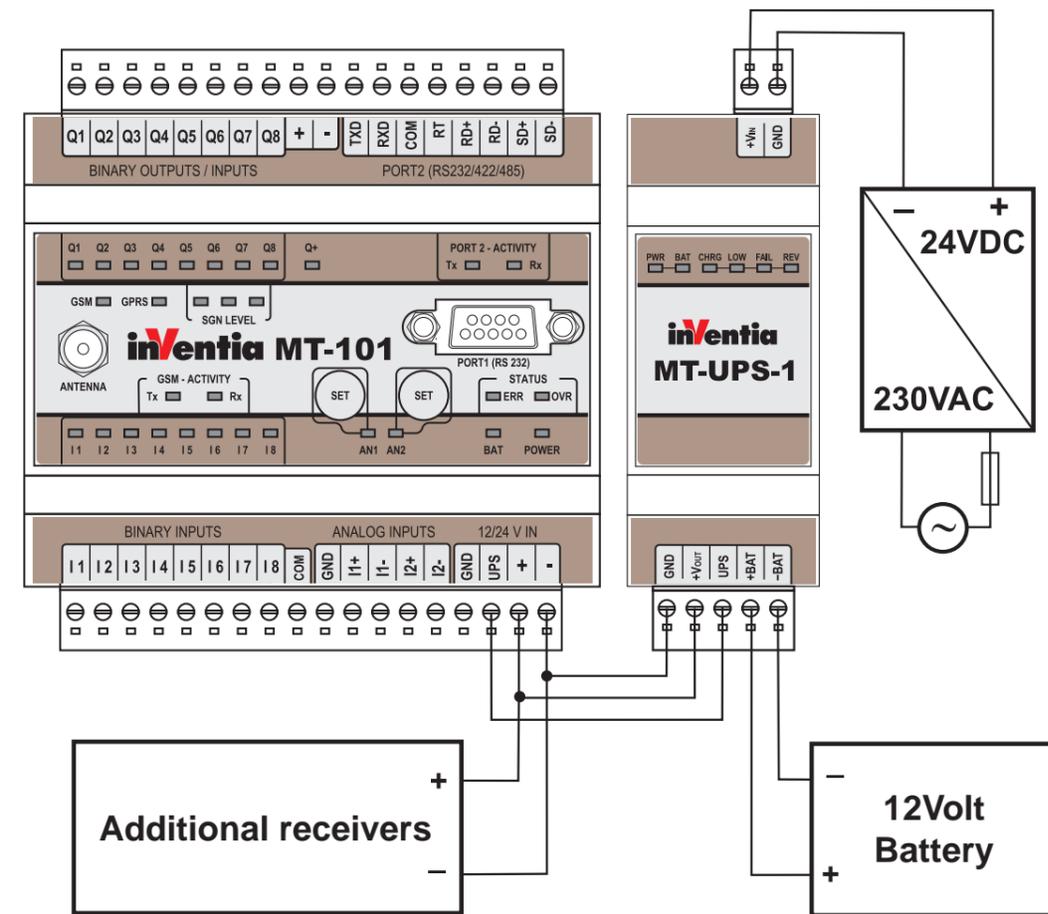
Technical data:

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

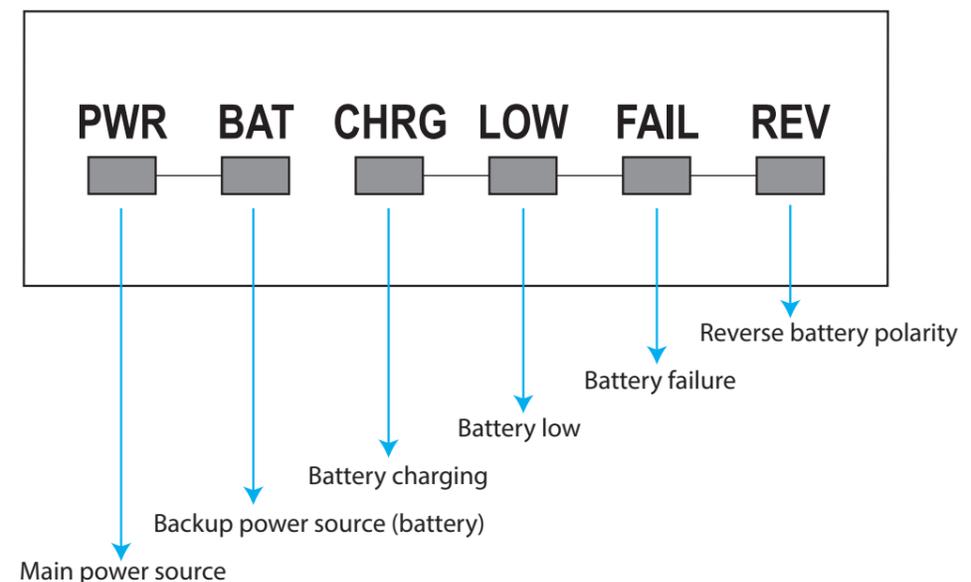
Drawings and dimensions (all dimenitions in millimeters)



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

Dedicated telemetry modules in cathodic protection

by Maciej Malicki

Introduction

Cathodic protection (CP) is an electrochemical method of corrosion protection that can be applied to any steel objects / structures buried in the ground or submerged in water. Cathodic protection is referred to as active protection, as opposed to passive ones, such as e.g. insulation coatings. Using simultaneously the active and passive methods provides effective and economical protection of the structure, resulting in failure-free operation over many years.

The principle of cathodic protection is to supply electrical current of sufficient density to the protected structure to produce the desired electrochemical effect. In case of low current demand the cathodic protection can be accomplished with the use of galvanic anodes. When the amount of electric current needed to protect the structure is significant (due to its large size and / or poor condition of the insulation coating), the so called impressed current system with DC power source (often a transformer-rectifier) is the most appropriate.

Cathodic protection is also associated with the problem of stray currents, which can cause corrosion of metals. One of the sources of stray currents is railway traction, and the factor contributing to their occurrence is the discontinuity of the rails forming part of the return circuit of the locomotive powering. Stray currents are especially dangerous for pipelines because they can flow in pipes at distances up to several tens of kilometers, and in places of their outflows they are capable to cause wall perforations in a very short time. One way to protect against stray currents is to install electrical drainages that are designed to drain stray currents from the structure to their source in a safe and controlled manner.

Since cathodic protection transformer-rectifiers and drainage devices are distributed over a large area and are often located in places difficult to access, it is economically justified to use telemetry to remotely control them and monitor their operating parameters.

Implementation

As part of this implementation, MT-652 modules have been installed in existing transformer-rectifier and drainage cabinets. The Customer, Gas Transmission Operator Gaz-System SA, has appointed 126 sites to launch a telemetry system in the operation area of regional units: Kraków, Pogórska Wola, Sandomierz, Jarosław and Jasło. The selected facilities include mainly transformer-rectifiers, as well as several drainage devices.

Since the existing facilities were built at different times and according to inconsistent standards, the installation of telemetry modules in each of them required an individual approach. Typically, the installation was done on a TS35 rail located on the right side of the cabinet. The following components were installed along with the telemetry module on the rail located in the transformer-rectifier cabinets: telemetry module power supply, measuring shunt and external relay selected according to the current rating of the CP power source. In addition, to enable the signalling of opening the cabinet doors, magnetic reed switches were mounted.

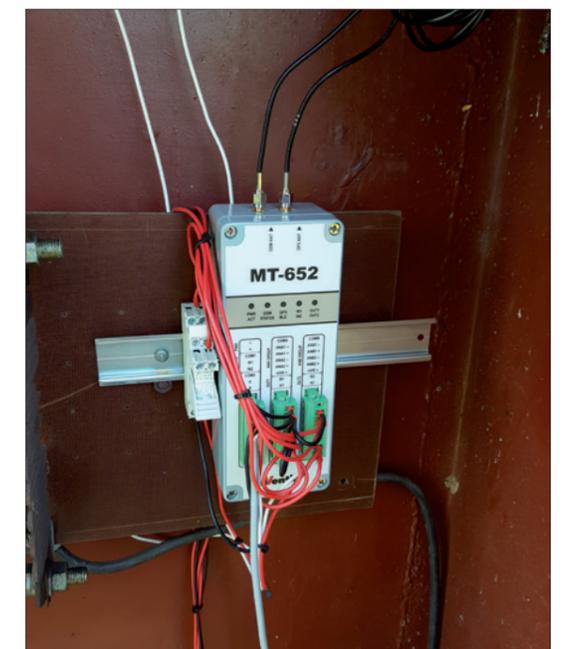
In order to ensure the ability to measure the IR free potential, coupons with an area of 10 cm² used to simulate a defect were also installed at the drainage devices. Polarized drainage devices are not connected to mains power, so external battery packs were used to power the telemetry modules on these sites. The MT-652's energy-efficient mode of operation allows maintenance-free operation in such conditions extending from several months to several years depending on the configured measurement frequency and transmission to the master system.

The installed telemetry modules allow the remote reading of operating parameters of cathodic protection devices, e.g. voltage and current output and ON/OFF potential at the drainage connection point. The devices also enable the remote switching of transformer-rectifiers and synchronous timing necessary for measurements. Synchronous measurement of IR free potential is also performed on coupons mounted at the drainage devices.

The devices have been fitted with SIM cards provided by the customer and incorporated into the TelWinSCADA software-based telemetry system used by the customer.

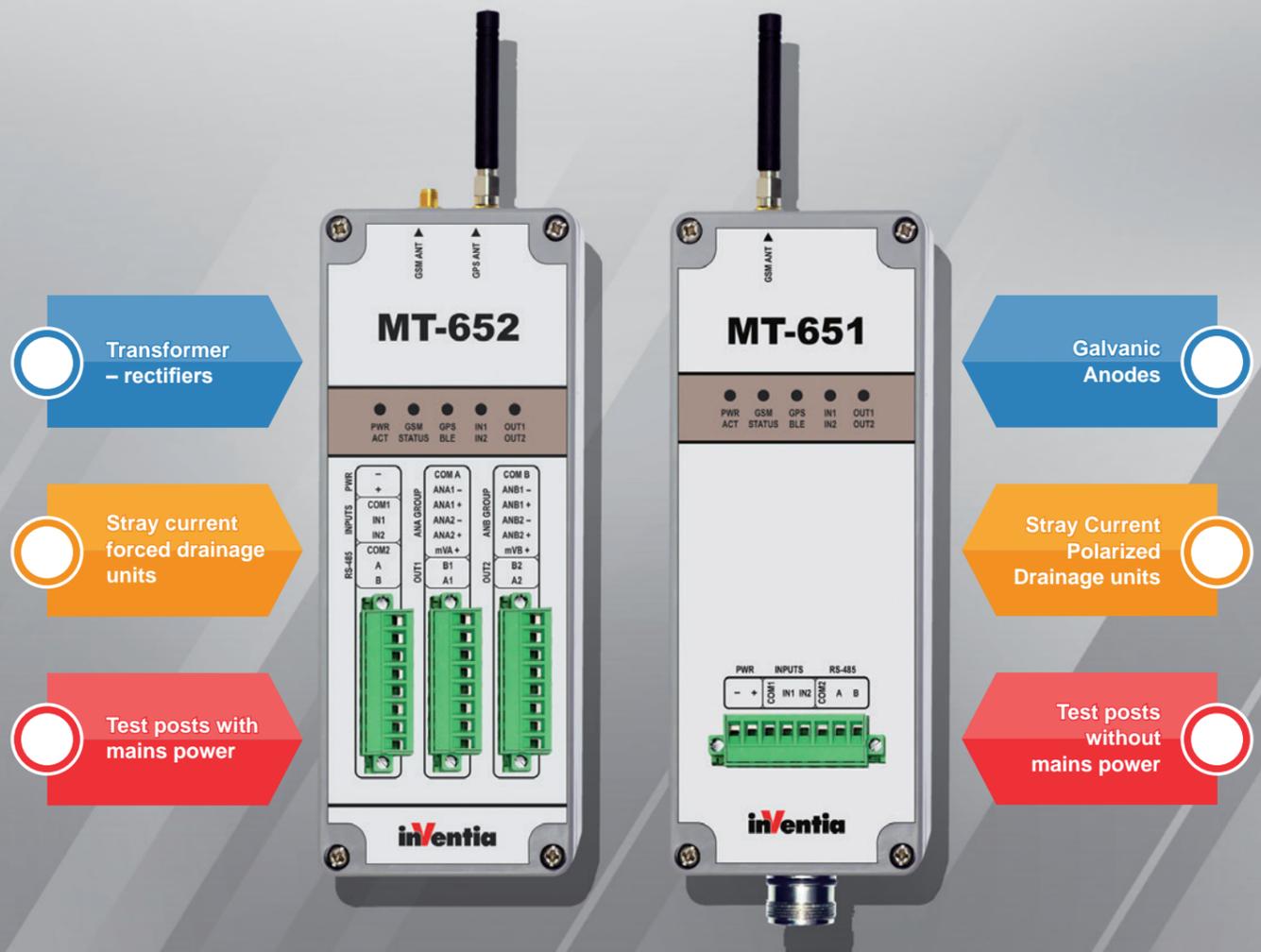


View of the MT-652 module installed in a transformer-rectifier cabinet



View of the MT-652 module installed in a polarized drainage cabinet

Measurement and control devices in cathodic protection



INVENTIA, in close cooperation with SPECKOR Maciej Malicki, has developed and introduced two new telemetry modules MT-652 and MT-651, designed to monitor parameters and control the cathodic protection installations of pipelines, tanks and other metal structures buried in the ground or submerged in water. Relying on many years of experience in various telemetry solutions and extensive knowledge of cathodic protection, the modules meet the needs of integrators and users of this type of installations.

Both modules are encapsulated in a compact fibreglass-reinforced plastic housing that provides IP65 protection. They can perform measurements through two separate and independently working analogue input groups. Each of these groups includes:

- two configurable analogue inputs with a range of ± 10 V or ± 100 V and a measurement resolution of 1 mV
- one analogue input with a range of ± 100 mV and a resolution of 1 μ V

This means that each telemetry module offers up to 6 measuring channels, which allows, for example, simultaneous monitoring of 2 cathodic protection rectifiers. In addition to the described analogue inputs, the terminal has two binary inputs and two binary outputs. These resources can be used to signal any state, e.g. cabinet door opening. The purpose of binary outputs is to accomplish typical tasks, i.e. measuring the IR free potential of the structure or coupon, manual off/on switching of any circuit or synchronized controlling the output according to a predefined time schedule.

Both the MT-652 and the MT-651 are equipped with an internal GPS receiver, which is an extremely important feature in this case. In addition to geo positioning, it is used for precise device time synchronization, based on which sequential measurements are made, and then marked with an individual time stamp.

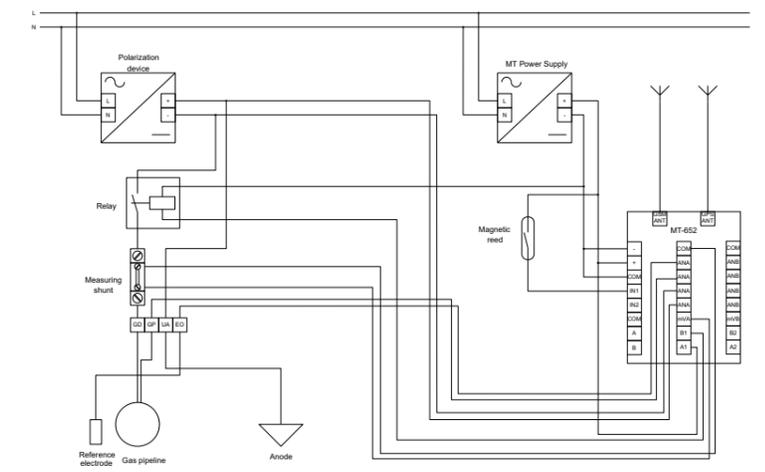
Five signalling LEDs are located on the front panel of the module. They are used by the module to present the current status of the GSM modem, the GPS receiver, and the status of the inputs and outputs. This information may be useful while verifying the current status of the device or solving problems related to its current operation. Input and output connectors, to which signals from the field may be connected, are located on the front side of the MT-652 module. To ease the installation of the module in a CP test post, where the available mounting space is very limited, the MT-651 has the signal connectors moved to the lower wall of the unit, providing a hermetic 19-pin

connector. At the top of the device there are two SMA connectors, one for a GSM antenna and the other for a GPS antenna. In the MT-651 telemetry module, the GPS antenna is placed directly inside the housing.

These telemetry modules can be powered by an external voltage of 7 – 30 VDC. Additionally, the MT-652 has an internal 2.6 Ah Li-Ion rechargeable battery of 3.7 V nominal voltage which ensures uninterrupted operation in case of the mains power failure. The MT-651 features the main powering function by a 17.4 Ah internal battery pack of 10.8 V nominal voltage. Therefore this unit is predestined for self-operation on an internal battery pack in locations where no external fixed power supply is available.

It is standard for new solutions offered by INVENTIA to support two SIM cards and the same is the case with the modules mentioned above. This ensures high reliability in the implementation of GPRS packet transmission. When the device is not logged on using the main SIM card, it will try to switch to a the backup SIM to successfully establish a data connection.

The MT-652 and MT-651 modules, as the entire family of telemetry devices we offer, are supported by the free MTManager configuration environment and MTData Provider communication software. The software communicates with the devices and provides current data through the standard OPC interface. In the case of historical data, it is possible to save them in relational SQL databases using ODBC sources or save directly the received data as CSV files. Thus, we provide designers, integrators, and system users a wide range of integration capabilities with supervisory systems.



Sample wiring diagram for application of MT-652 in CP station

Welotec Routers TK500



In 2017 we are expanding the range of our Welotec routers by a new family, i.e. units marked as TK500. The new model is a compromise between the simplicity of the TK700 router configuration and the speed available in the TK800. New technology solutions have made it possible to offer lower prices than in models of the TK700 family with similar functionality!

The TK500 is available in 3G version (HSDPA, HSUPA, and HSPA) and LTE version. LTE technology, in addition to increased speed, significantly reduces communication latency (improving network responsiveness), and ensures greater connection stability due to higher interference immunity and increased network cell capacity. Of course, the routers also support older 2G technology (GPRS, EDGE).

The most important feature of mobile communication solutions is the stability of connection with the network of the mobile operator. The TK500 routers, like the older models, have two built-in connection testing mechanisms. The first, low-level, one checks if communication with the PPP server (PPP LCP echo) is possible. The second mechanism tests whether the operation of the link itself is correct by sending test frames (ICMP ping) to the specified IP address. This ensures that the router responds quickly to a connection loss and restores the smooth operation of the link. In the vast majority of cases, these incidents are not noticeable for the user.

The routers are equipped with five Ethernet connectors, one of them can work as a WAN port. In addition, the TK505L-W is equipped with a Wi-Fi module for connecting additional devices. It supports IEEE 802.11n standard with the maximum transfer rate of 300 Mbit/s.

The routers also allow you to set up VPN tunnels (Virtual Private Network – these are point-to-point connections over a private network or a public network such as the Internet), which enable secure data transmission over a cellular network. The devices on both sides of the tunnel are not visible from the network in which the tunnel is established, nor do they themselves have access to addresses outside the tunnel. Such solutions allow safe and trouble-free communication with remote devices, e.g. in order to reconfigure PLCs or ATM monitoring. The routers support the following tunnelling protocols: IPsec, OpenVPN, and GRE.

The TK500 is equipped with RS-232/485 serial port. It can be used to work with an external virtual COM port server, enabling remote support for older devices and also for the ones without remote operation capability. In addition, the serial port can be used to communicate with ModbusRTU-enabled devices. The router can perform auto-translation of ModbusRTU to ModbusTCP enabling the devices communicating over the serial port to be visible on the network as ModbusTCP devices.

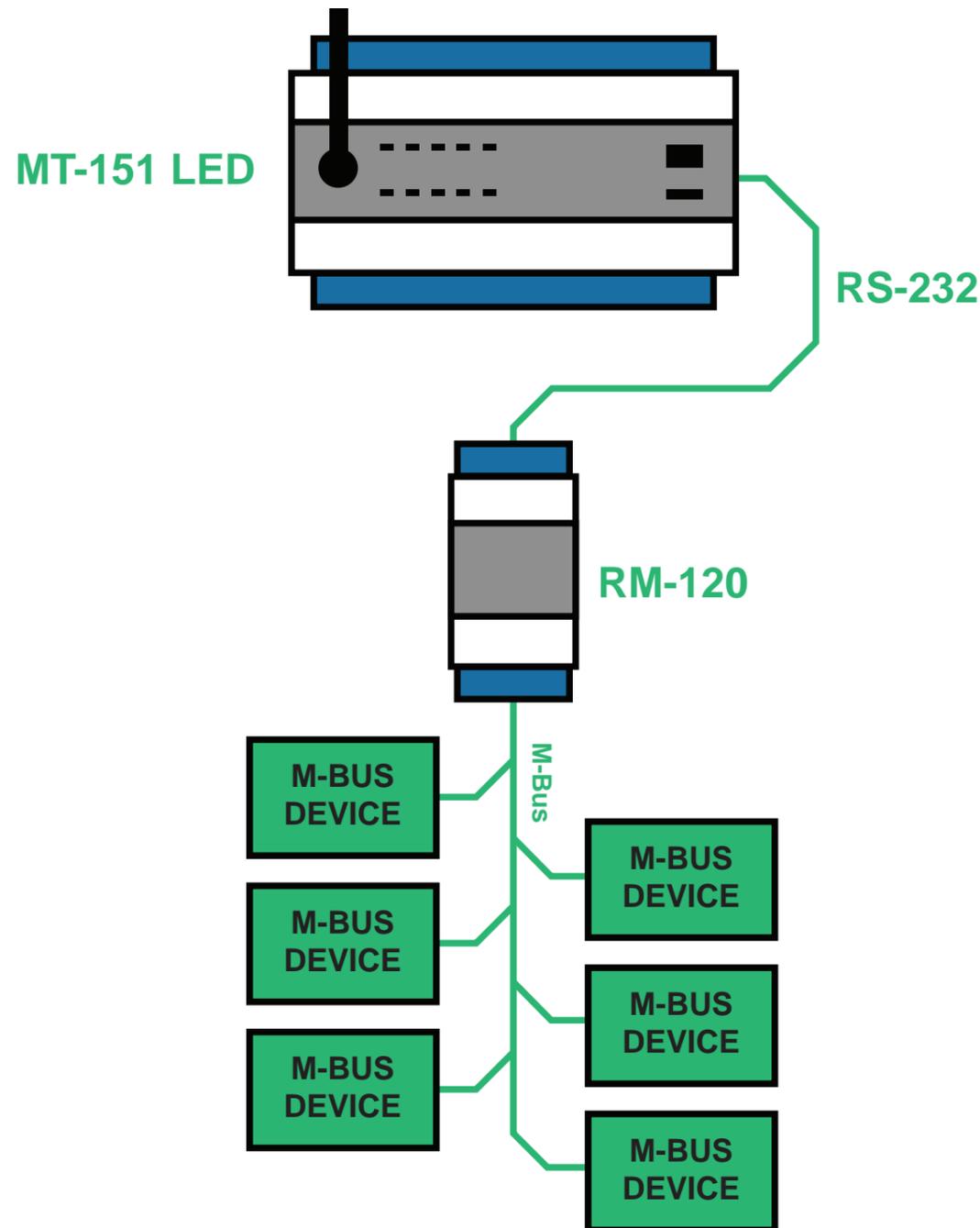
The TK500 housing is more compact than that of the TK700 or TK800, and thus requires less space in the cabinet. It is a sturdy metal structure with IP30 protection class for mounting on a DIN rail and, using a special hanger, screwed directly to a flat surface.

TK515L router basic features

- 5-band GSM / GPRS / EDGE / UMTS / HSDPA / HSUPA / HSPA + / LTE modem with automatic session setup and restore
- Five galvanically isolated 10/100 Mbps Ethernet ports, RJ45, Auto MDI / MDIX Ethernet ports
- RS-232/485 port
- Real time clock
- Hardware and software watchdog
- Serial protocols: ModbusTCP / RTU, Transparent TCP Connection, Virtual COM port
- Network protocols: ICMP, IP, TCP, UDP, DHCP, PPP, ARP, Telnet, DNS, SSH, VRRP, HTTP, HTTPS, NTP, SMTP
- Networking functions: routing, connection testing, NAT, PAT, virtual IP address mapping, DDNS (DynDNS), VRRP
- Security: IPsec, OpenVPN, GRE, PPTP, L2TP, authentication (password, certificate), firewall, access control (rules for TCP and UDP protocols and ICMP packets), MAC address filtering, port forwarding, demilitarized zone (DMZ)
- Metal housing, IP30 protection class
- DIN rail mounting, detachable terminal strips
- 12 – 24 VDC power supply

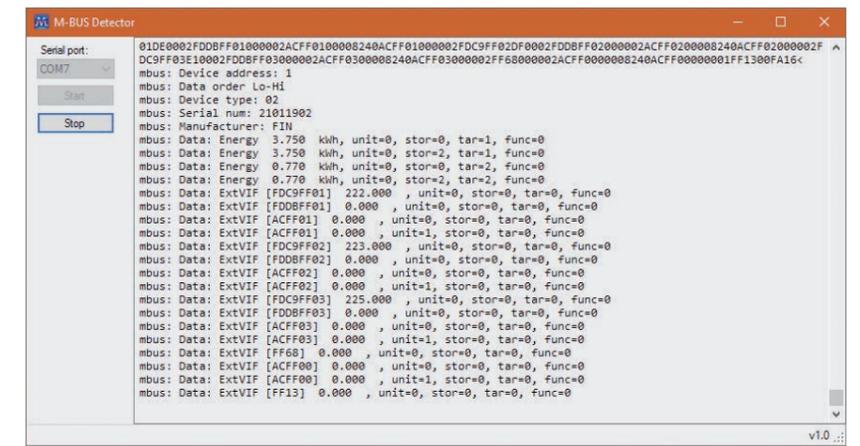
Model	TK515L-W	TK515L	TK505U	TK505W
2G	GSM, GPRS, EDGE	GSM, GPRS, EDGE	GSM, GPRS, EDGE	–
3G	UMTS, HSDPA, HSUPA, HSPA+	UMTS, HSDPA, HSUPA, HSPA+	UMTS, HSDPA, HSUPA, HSPA	–
4G	LTE	LTE	–	–
Max. downloading speed	100,0 Mb/s	100,0 Mb/s	14,4 Mb/s	–
Max. sending speed	50,0 Mb/s	50,0 Mb/s	5,76 Mb/s	–
Ethernet	5 x RJ45 port 10/100TX - Auto MDI/MDI-X			
Additional interfaces	RS-232/485 Wi-Fi IEEE 802.11n	RS-232/485	RS-232/485	RS-232/485

M-Bus protocol in MT-151 LED



The new MT-151 LED controller firmware allows this device to communicate directly with heat meters, water meters, electricity meters and other M-Bus data transmitters. The firmware enables reading data from most devices, including custom protocol implementations.

Adding new devices is made significantly easier by the M-Bus Detector program. It allows you to view the data sent by the device and, with knowledge of the measured values, recognize the identifiers used, including custom VIFE identifiers. This allows you to configure the module to read all data sent by the meter. Even with incomplete documentation of the transmitting device, or lack of it!



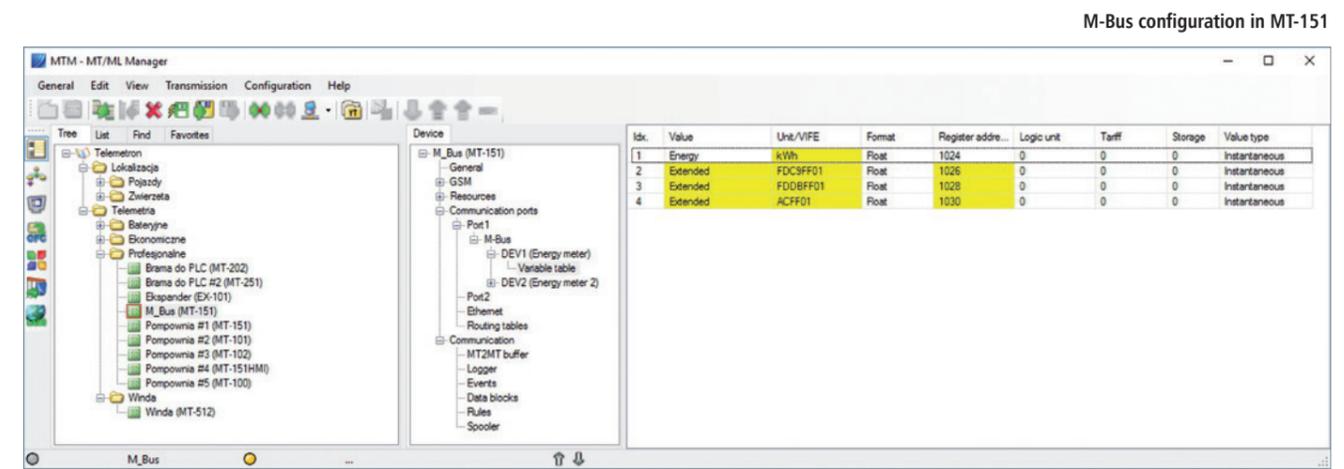
Sample of Energy meter reading by M-bus Detector

The MT-151 can work in broadcast mode, which allows you to read the device without knowing its M-Bus address. In this mode you can communicate with only one device. The „unicast“ mode allows communication with up to 16 devices. Under the „unicast“ mode, two addressing methods are supported:

- Primary address – the address of the device is a number in the range from 1 to 253
- Secondary Address – the address of the device is the last 8 digits of its serial number

Both methods can be used within a single module at the same time, i.e. some M-Bus devices can be addressed by primary addresses and some by secondary addresses. This allows the module to communicate with devices even when they support different addressing methods.

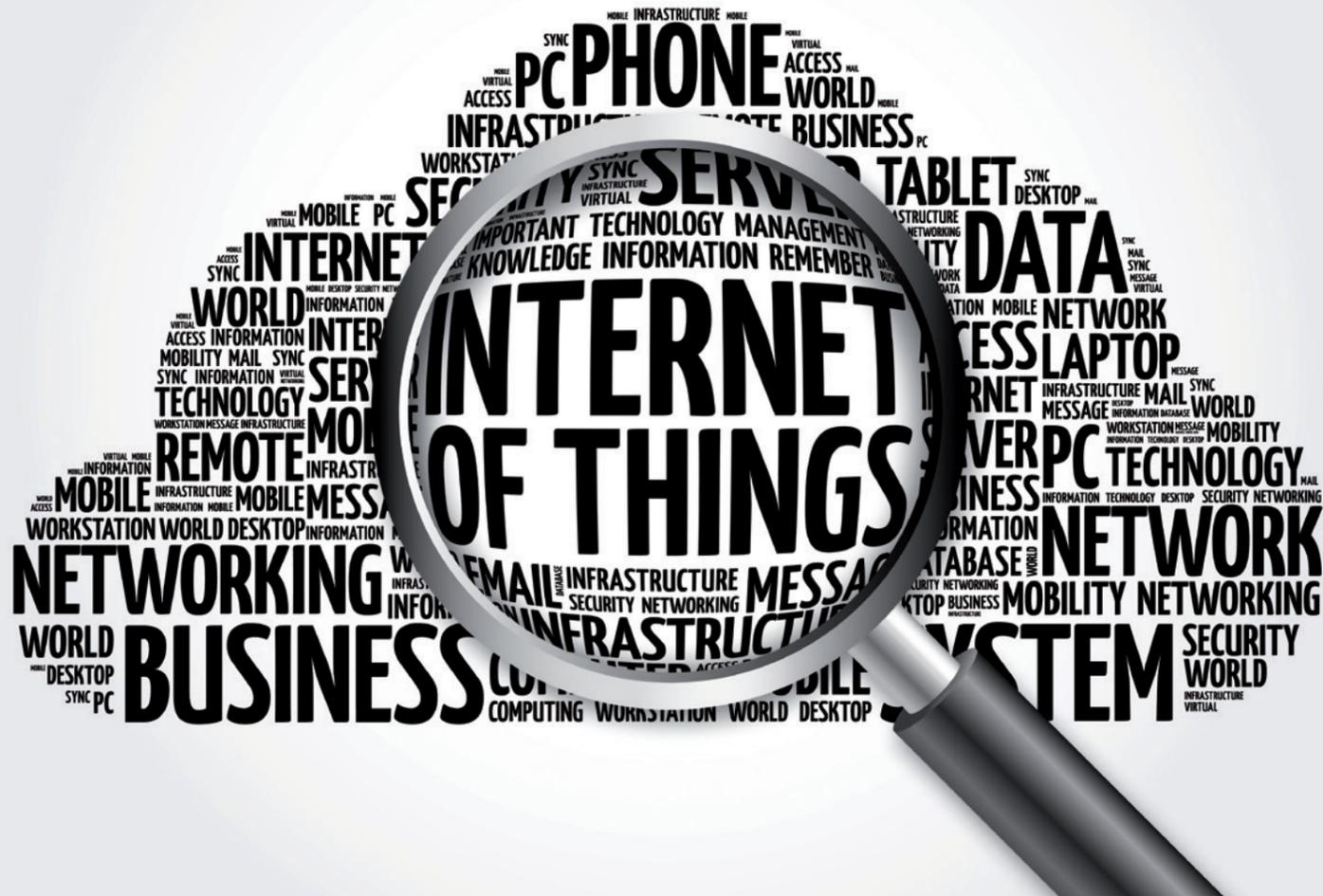
Because the MT-151 does not have an M-Bus compliant port, an external RM-120 converter is required to convert the RS-232 signals to M-Bus compliant signals.



M-Bus configuration in MT-151

M-Bus

Abbreviation from Meter Bus. This is the protocol designed for remote reading of utility meters (water, heat, gas, electricity). The M-Bus interface is a two-wire data bus and provides power to the meters. It is an economical and very popular solution.



IoT – new family of sensors

The range of IoT devices offered by Inventia also includes radio receivers IOT-RG-01 / IOT-RT-02 (communications gateways), which provide radio data reception from distributed peripheral sensors. Access to the collected measurement data is provided with the use of the available serial port, depending on the model, RS-232 or RS-485, and Modbus RTU communication protocol. The devices can be powered directly from the serial port at 5 VDC, which puts them in the group of low-power telemetry solutions. As an option, the module can be powered from an external source of voltage in the range of 5 – 30 VDC. Data retrieval, non-volatile memory recording as well as long distance transport can be carried out using standard telemetry modules such as MT-202, MT-251, etc. with GPRS packet data transmission.



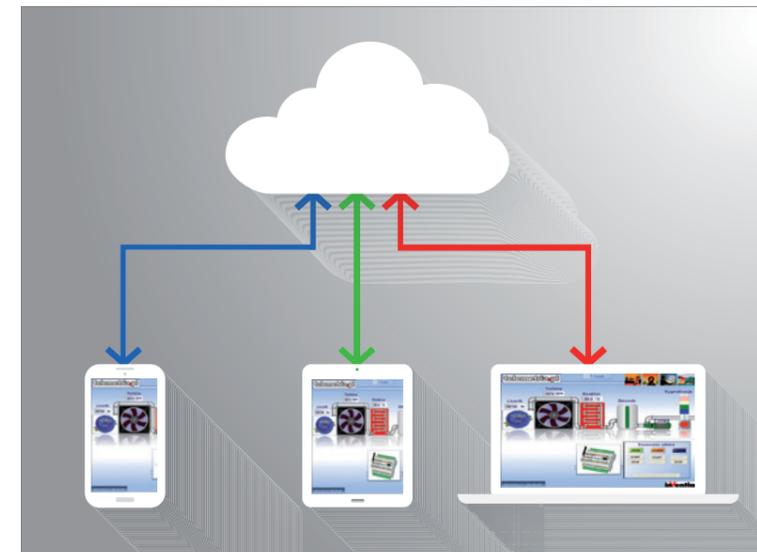
The IoT family also offers a radio tester module (model IOT-TST-01). On the OLED display the tester shows the signal strength of visible and compatible sensors and gateways in the radio communications system being tested. This device guarantees the best location for mounting IoT devices as regards radio propagation so that optimum distributed transmission systems can be built.

The **Internet of Things** is a term that is increasingly on the lips of „tech people“, including those related to the broadly understood industry. According to numerous reports, by 2020 there will be over 50 billion devices on the Internet. In addition to household appliances (such as refrigerators, washing machines, TV sets, etc.), the reports also mention many devices used in factories and production lines, such as PLCs, I/O systems, sensors, HMIs, etc. In industry, it is required that the devices are able to collect, process and transmit huge amounts of data. A convenient solution here is the cloud because it allow easy access to data and makes it possible to analyse and transform them into information useful for process management.

communications, if conditions are favourable, can reach up to 300 meters with low power requirements and no need for additional amplifiers. The technology itself is geared towards the transmission of small amounts of data.

In the first stage, we offered two sensors to users. The first model, **IOT-RT-01**, was designed to measure temperatures in the range -20.0 °C to +60.0 °C. The second one, **IOT-RTH-01**, apart from the temperature measurement function, also measures humidity in the range 0.0 % to 100.0 %. Both sensors are built in a polymer case of IP30 protection class. The sensors are powered by an internal lithium battery rated at 3.6 VDC, which provides up to 5 years of autonomous operation with a single cell. In the near future we are going to enlarge the our IoT family by additional sensors, which would be used in intelligent building applications (light sensors, motion sensors, etc.) and systems for measuring electricity, gas and water consumption.

This year, Inventia has also launched a new range of wireless sensors based on **LoRa radio technology**. This solution uses the 869.40 – 869.65 MHz radio frequency band, which does not require any license. The family of these products provides affordable and easy implementation methods in locations where for various reasons it is impossible to lay signal and power cables. The practical range of radio



DATAPORTAL →



Predictive surveillance system in power industry

by Jarosław Strojcki

It is true that a bit of luck is needed in life, but just relying on it can bring catastrophic results. That is why the advanced technology for continuous monitoring quickly enters our technical community. This is best seen in automotive industry, where the resources used to monitoring are immense.

It is to be noted that based on sensor information, the on-board computers in a vehicle do a lot of things for the driver. One of such sensors is the tire pressure sensor. This sensor, based on the SAW (surface acoustic wave) technology, converts the pressure to the electrical

quantities and transmits the measurement results from the rolling wheel to the antenna located in mudguard. Automotive industry sets trends in predictive maintenance, whose primary purpose is anticipation of failure. It is always better to know about the threat an hour earlier than a fraction of a second too late.

Power industry is a very conservative field of technology, but here the sparks of innovative thinking appear too. Modern control should be used in moderation and always use the adequate measures for given application. The case of surveillance is quite different, here there are no restrictions. The more information about the object activity, the better for its security. The number of sensors used to monitor an object does not matter, of course, within reasonable limits. For high reliability of measurements, the redundant circuits or „heartbeat” sensors are used for self-monitoring.

On the last year's Energetics Fair in Lublin an innovative solution was presented that is a part of the Predictive Maintenance methodology. This is an open system of surveillance of built-in power objects which are often located in „the middle of nowhere”. The planned review of such facilities is extremely important for their proper operation. Signalling and registration of the open door of



the transformer station can be a confirmation of the presence of the maintenance staff or the presence of an intruder, which, for safety reasons, is an important factor in generating an alarm. This solution was applied in transformer station STLmb 15 / 0.4 kV produced by Elektromontaż-Lublin. The potential of this innovation treasure was appreciated by the President of the Polish-Belarusian Chamber of Commerce, who rewarded this modern transformer station with a cup funded by him.

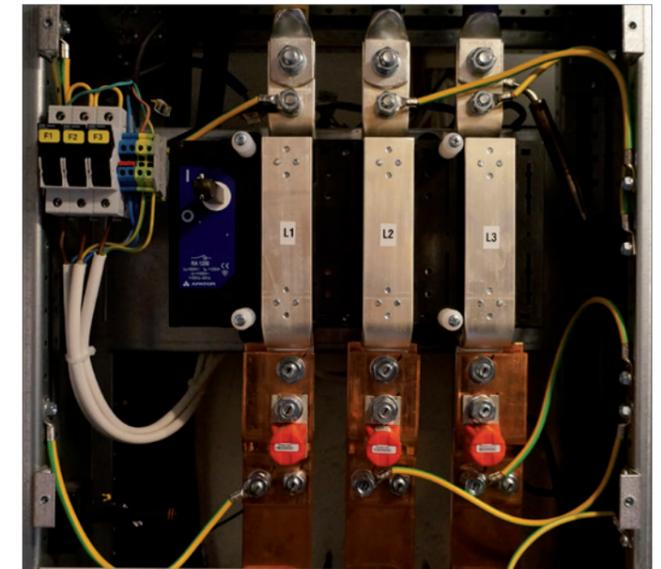
The innovativeness of this facility simply refers to the automotive. The wireless temperature measurement used in the transformer substations on both medium and low voltage side is based on SAW technology. Yes, it is the same technology which is used in car wheels. Other solutions used in this facility also determine directions for the development of predictive supervision of power objects. In addition to these wireless IntelliSAW temperature measurements, you can also measure humidity and temperature in and out of the station, detect water presence in the station, and use fire extinguisher system named "Pliszka". In this last application, an important element of the system was the design of special shutters automatically shut down by the engineers from Elektromontaż-Lublin before releasing the gas extinguishing the fire.

Of course, in order to meet the conditions of predictive maintenance, in addition to the sensors, at least two brains are needed. One is a MT-151 HMI telemetry module and the other is a data analysis engineer. No advanced MT-151 HMI is required for basic power industry applications, but its advantages are that it is dedicated to measuring the temperature at critical points in a transformer station and in all voltage distribution boxes in both AC and DC circuits.

The display shows all the important parameters of the object and during the routine field inspection it is possible to verify these parameters with other measurement sources, such as thermal imaging cameras or humidity measuring instruments. Another advantage of the MT-151 HMI module is the built-in option of the recorder, which stores the defined parameters on the SD memory stick. In cases where GPRS transmission is for some reason unreachable, the data is saved and readable.

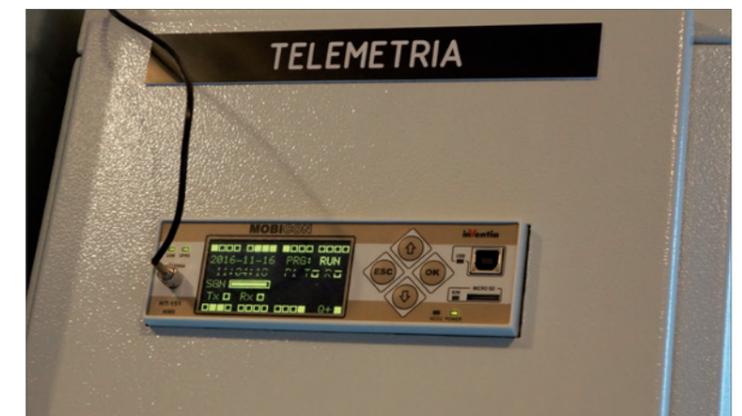
A large number of digital and analog inputs and outputs, as well as high-speed counters, opens up a wide range of possibilities for power object designers. The MODBUS RTU communication protocol provides information exchange between the various components of the surveillance and control system. If we take into account that the MT-151 HMI telemetry module is a fully functional programmable controller, we have an image of the potential capabilities of this unit in the supervision and control of objects, not only in the power industry.

The presented STLmb transformer station is an object which is well-protected against potential malfunction. The temperature rise



detected by the wireless IntelliSAW temperature sensors is transmitted to a telemetric module, where programmed thresholds for warning and alarm trigger the SMS sending process to defined destinations. Of course, the hierarchy of sent alerts is arbitrary. For example, at the warning level, the on-duty dispatcher team receives the message and, in the event of alarm, additionally the maintenance staff and supervisors of the facility.

For proper prediction, it is necessary to analyze the temperature increments on historical graphs. This mainly concerns industrial facilities. If the temperature increase on bus bar lines is too dynamic, and happens when all the devices are switched on simultaneously (start of change), the temperature on the cables connected to these

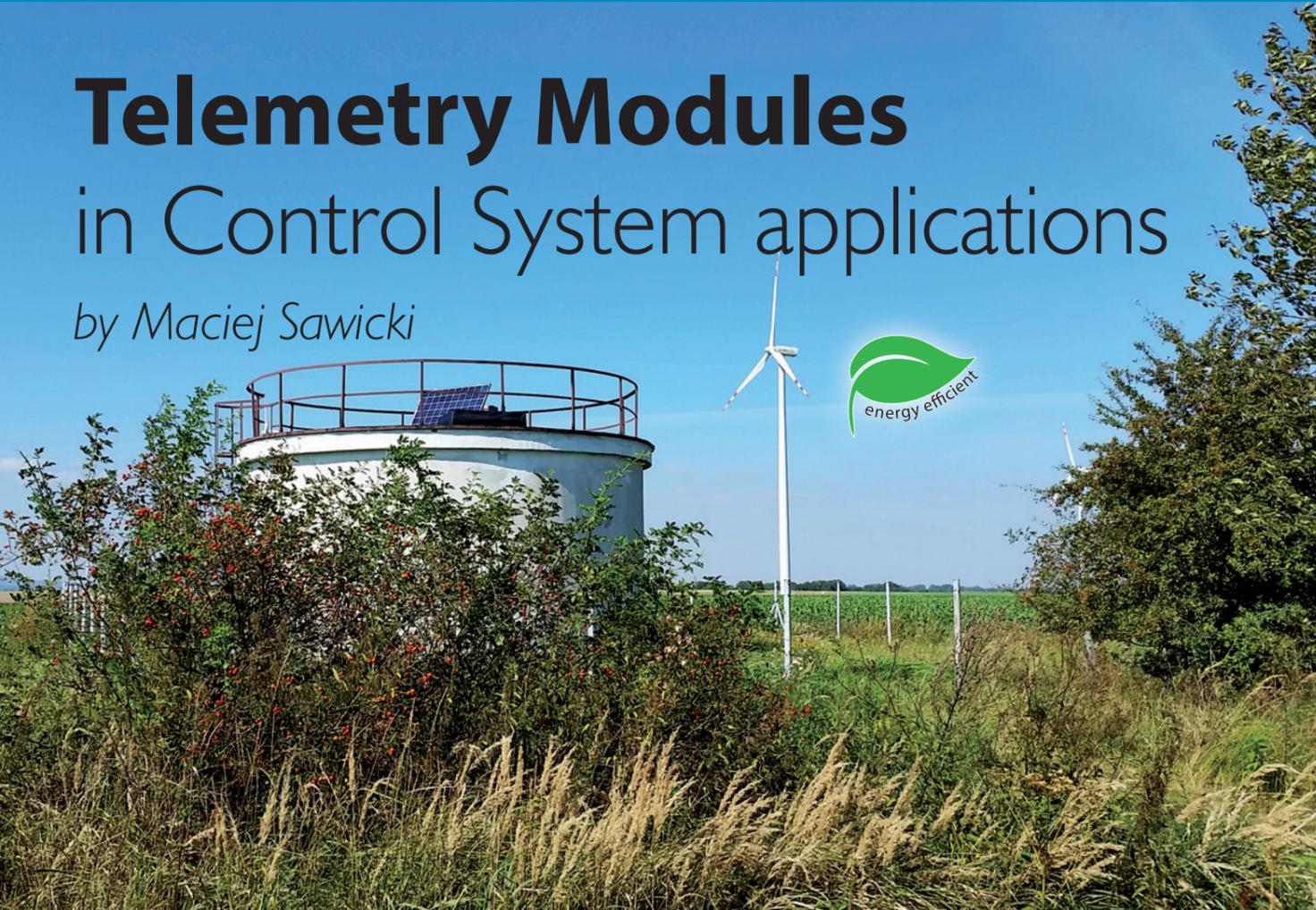


bus bars can be much higher than those indicated by the sensors. The elevated cable temperature, even short-lived but cyclical, degrades the insulation and can cause an electric arc, especially when humidity increases.



Telemetry Modules in Control System applications

by Maciej Sawicki



Utilizing the advanced functionality of the new generation MT-151, MT-251 and MT-331 telemetry modules from InVentia in applications developed and implemented by Control System – edition 02'2017.

Introduction

Dear Readers of TELEMETRON magazine, we are giving you the next article describing the most interesting solutions implemented by the engineers from CONTROL SYSTEM. Traditionally, this edition of the article is a follow-up of TELEMETRON magazine's publications from 2008 to 2016.

In the 10th edition of the article, as in previous years, we would like to introduce to TELEMETRON readers the most interesting and technologically advanced implementations made in 2016, together with partner companies and made by experienced engineering team of CONTROL SYSTEM. Consistently, for years we have focused on delivering solutions that require expert

knowledge and many years of experience, but at the same time remembering that our overriding goal is to create end-to-end applications of high quality which will fulfil the users' expectations.

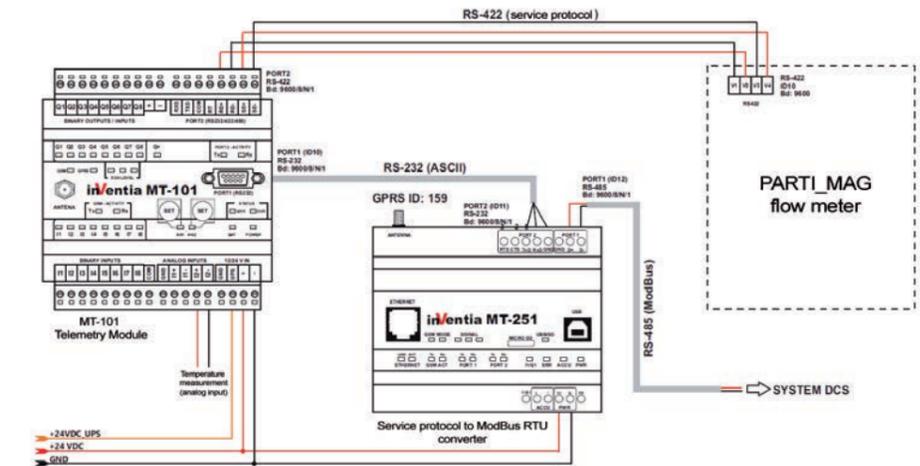
In 2016, all implementations made by our team were completely based on new generation modules, i.e. MT-151 LED and HMI, MT-251 and MT-331. The increased resources available in MT-151 together with the high performance of the modern processor used in this module significantly enhanced the functionality. The MT-251 3G gateway and WELOTEC routers provide seamless processing of data streams generated in networks consisting of over 120 telemetry modules. In many applications, the MT-331 module was used, which, due to its ability to work in two power modes, proved to be an extremely interesting device.

The closing balance of 2016 is already over 9500 pieces of MT-101, MT-151, MT-202, MT-251, MT-331 and MT-723 modules operating failure-free in Poland and Europe, with application software developed by CONTROL SYSTEM engineers.

In the following sections we will summarize the most interesting examples of telemetry modules applications.

MT-251 3G module as a modern communication gateway and protocol converter for DCS systems

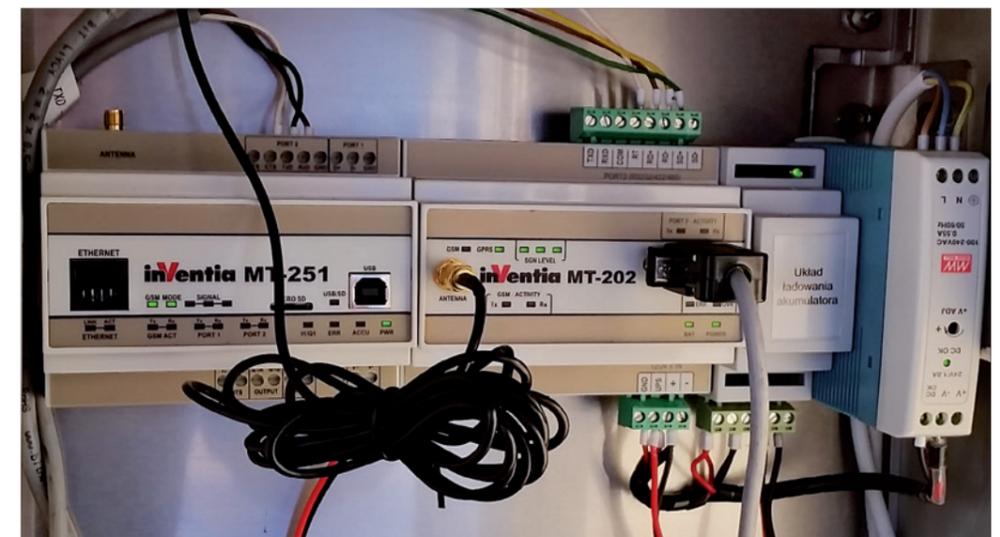
In 2016, at locations with more than 50 modules within a single telemetry infrastructure, MT-202 modular stations were upgraded to MT-251 3G modules at the dispatching stations, providing significantly higher data throughput to SCADA systems. The ability to connect the MT-251 to a local Ethernet network also allows the most effective selection

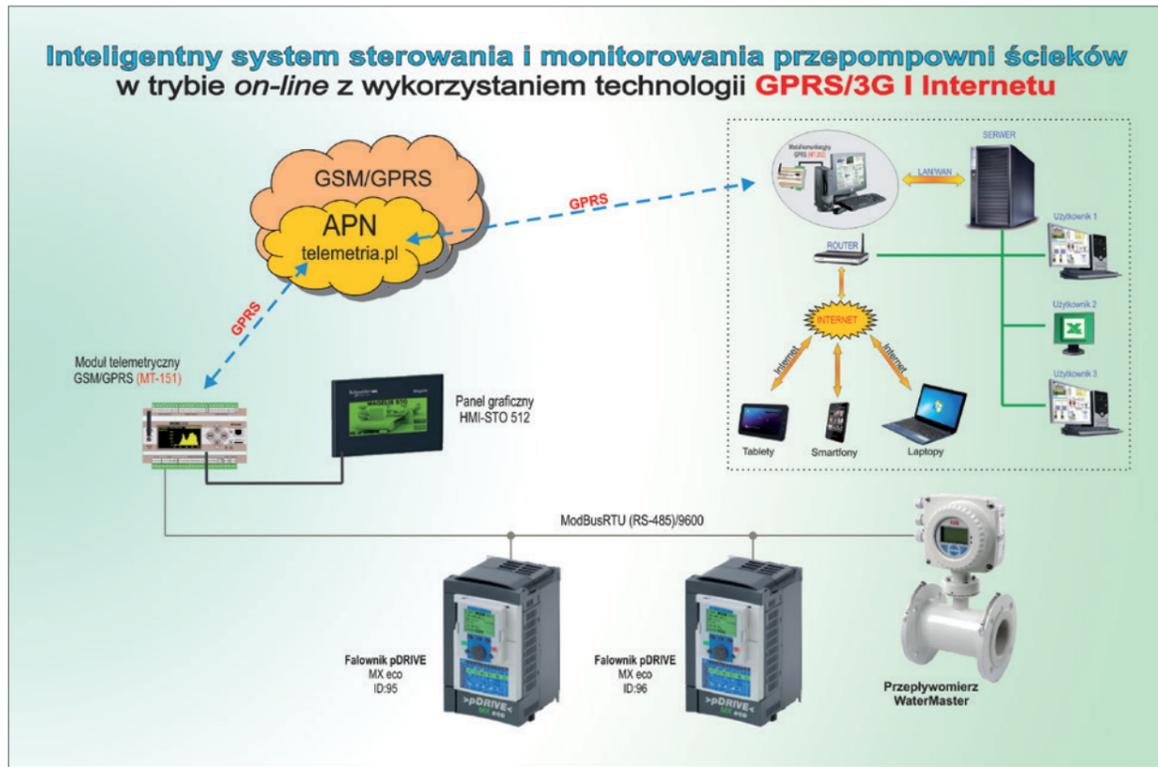


Another interesting application of the MT-251 module was its use as a RS-232 to RS-485 and ETHERNET converter. In deployed applications, the MT-251 module reads data from the MT-101 module via the RS-232 port, which acts as a non-standard protocol converter from the measuring device, and then makes it available in the MT-251 registers after adequate processing. As a result, the user accesses data on port n1 (RS-485) in the form of ModBus RTU protocol or on ETHERNET port in the form of ModBus TCP protocol.

The solution described above was used in power plant to provide digital data from a specialized flow meter to the global DCS system.

of the module location, i.e. the location where GSM signal strength is the highest. The limitations associated with the use of the RS-232 standard have thus been corrected. The digital output available in the MT-251 module is used to control external optical/acoustic signalling and to effectively inform the operator about the need to check the status of the monitored object in the SCADA system.

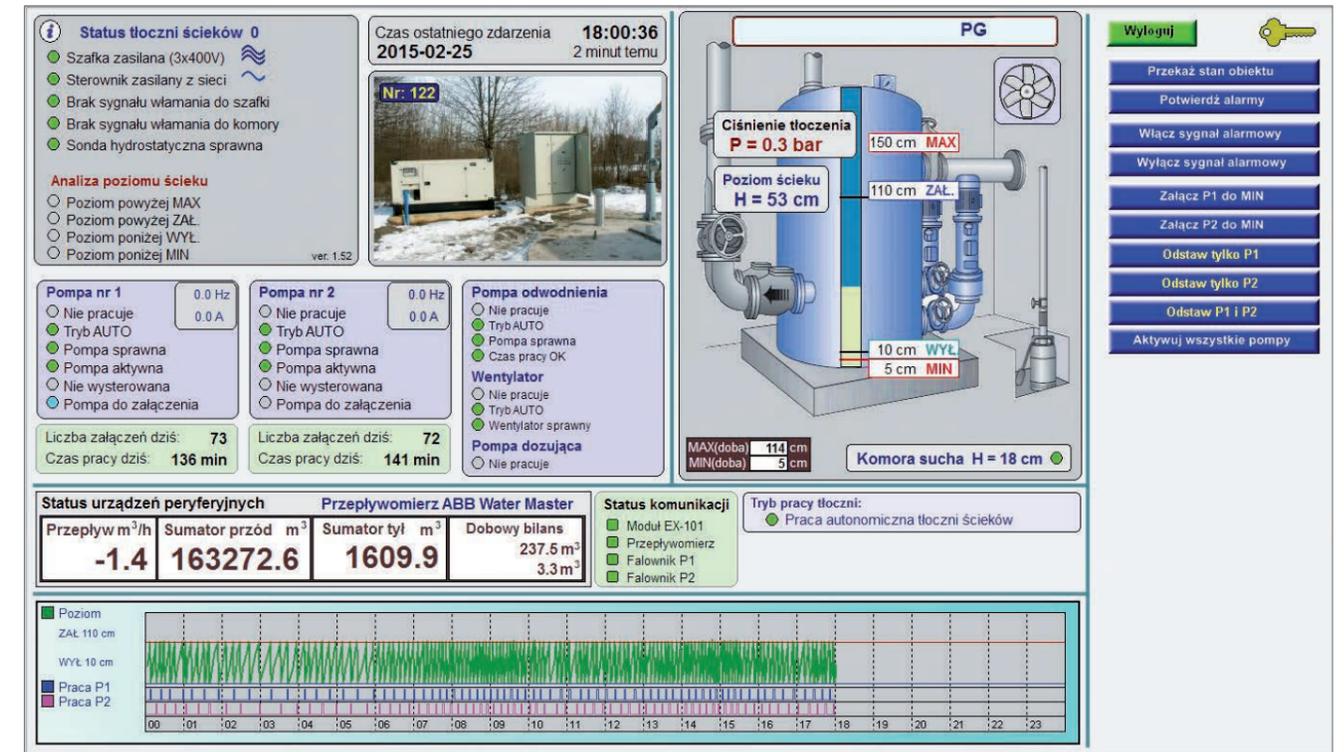




MT-151 HMI version mounted in control cabinets for sewage pumping stations

In 2016 our software team continued to develop application software to control the sewage pumping stations with the MT-151 LED and HMI modules. Application software has been designed to work with peripherals, such as inverters, soft starters, electromagnetic flow meters, network parameter analyzers, etc.

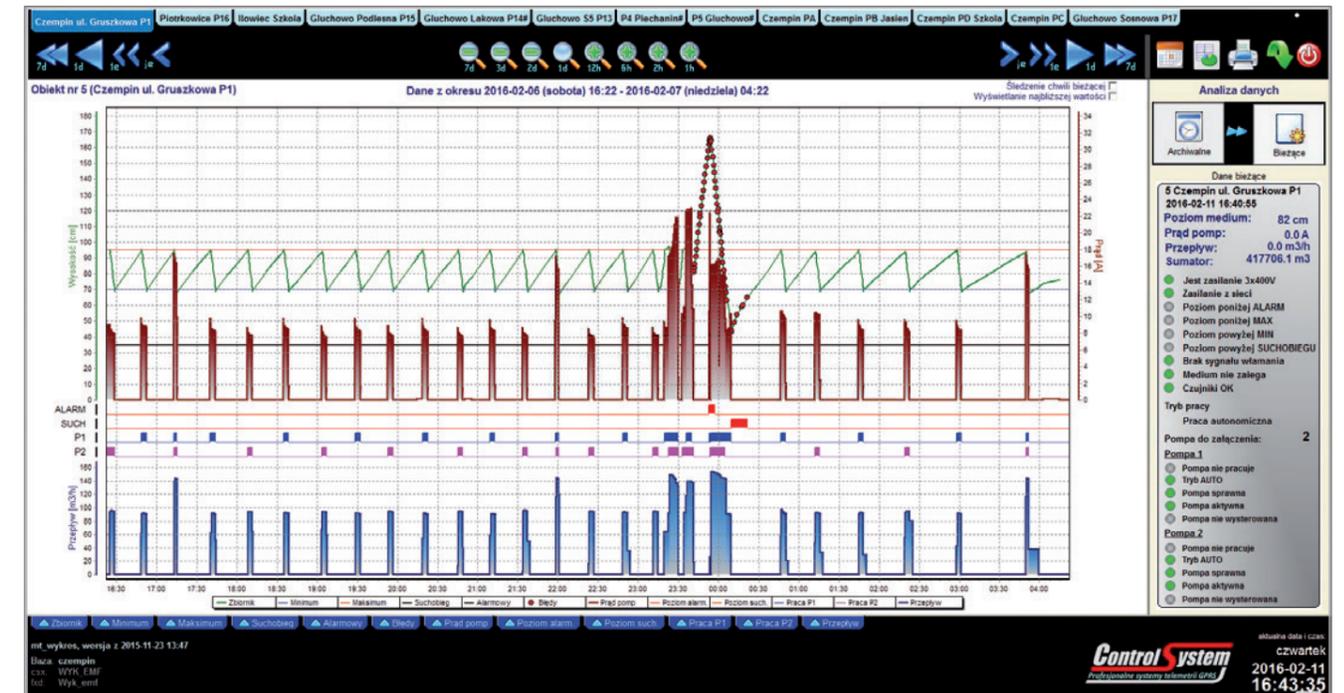
Available in the HMI version, the integrated graphics display provides local support for visualizing the most important process parameters without the need for an external graphics panel, estimated few hundred PLN. Thanks to the extended resources of the MT-151 module, e.g. in the case of sewage pumps, it was possible to implement in one control module the operation of a drainage pump as well as an additional ventilator for the dry chamber. The possibility of connecting external temperature transducers to the MT-151 module allows for more precise controlling of the set temperature.



The extension of functions implemented by the MT-151 module minimizes the number of additional elements in the cabinet. As a result, the use of the MT-151 does not increase the price of the control cabinet, but ensures that additional equipment is controlled by the application software stored in the MT-151 and all required additional information is transferred to the master SCADA system. The screenshot above shows an example of the control of a large

sewage pump station equipped with a pressure transducer and an electromagnetic flowmeter.

In 2016, we made another increase in the number of features available in a unique graphics recorder, which is an essential component of SCADA system offered by CONTROL SYSTEM for visualizing pumping stations.

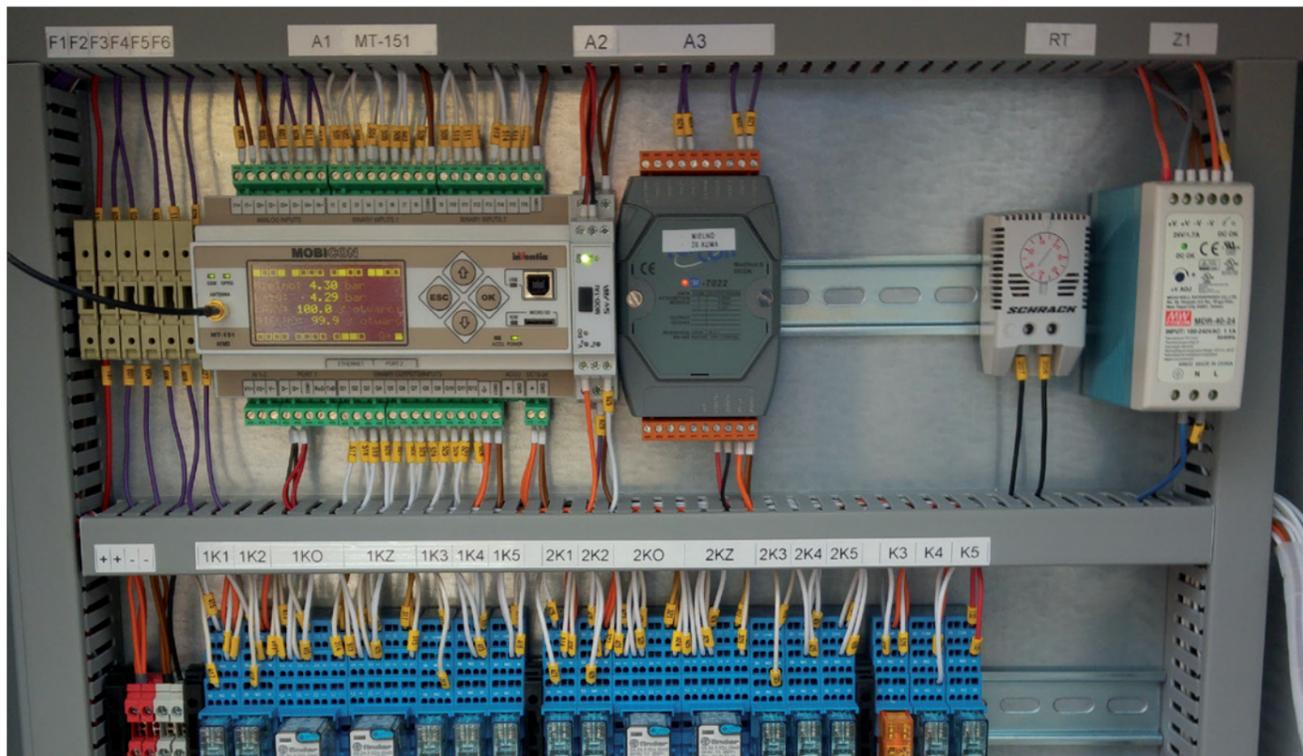
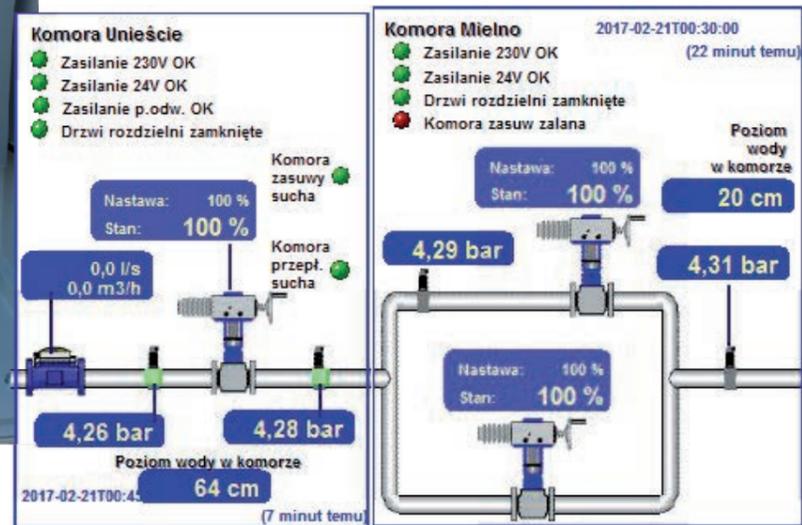




MT-151 HMI module controlling dampers in measuring chambers of clean water pipes

The functional capabilities offered by the MT-151 module are sufficient for the implementation of the complex mathematical process of controlling the valves in the control and measurement chambers of clean water pipes. In this case, the MT-151 software receives data from several measuring points, equipped with flowmeters and pressure transducers and, based on a complex algorithm, controls the angle of the throttle to maintain the desired flow of water in each segment of the water supply.

Below there is an example of a visualization of two chambers.



The examples presented here demonstrate the functional capabilities offered by the MT-151 telemetry module, which in such cases successfully replaces the traditional PLC connected to a GSM modem. Integration of process control and data transmission (3G) in one module and the ability to remotely modify a program in the MT-151 significantly reduces the costs associated with launching an object.

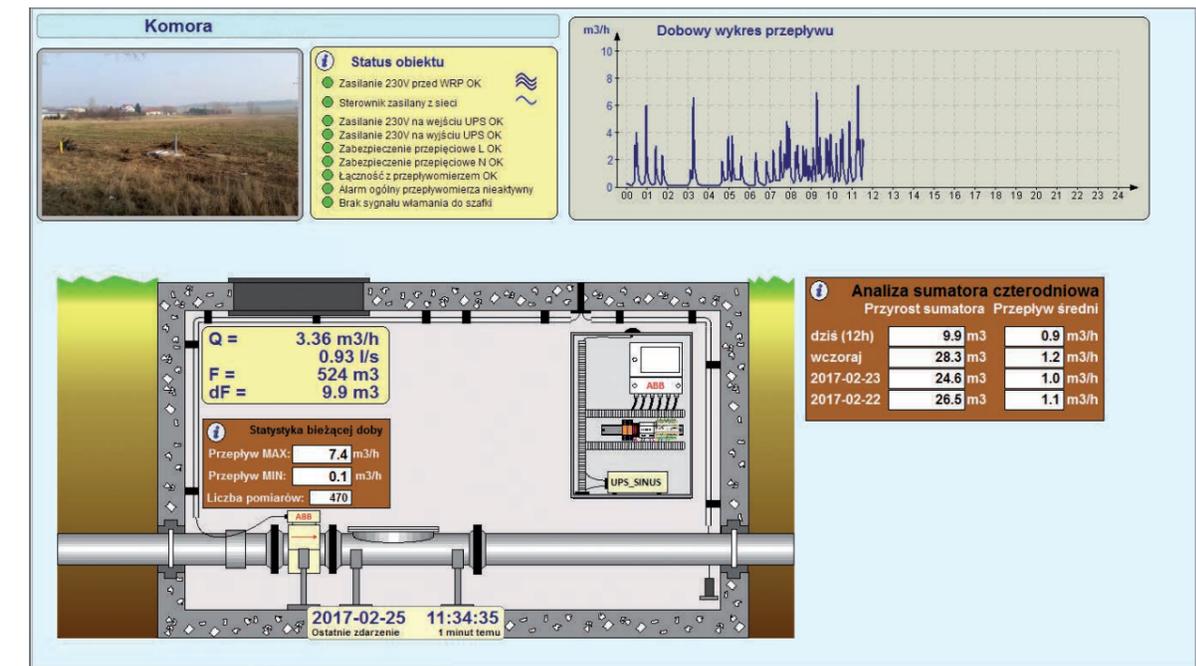
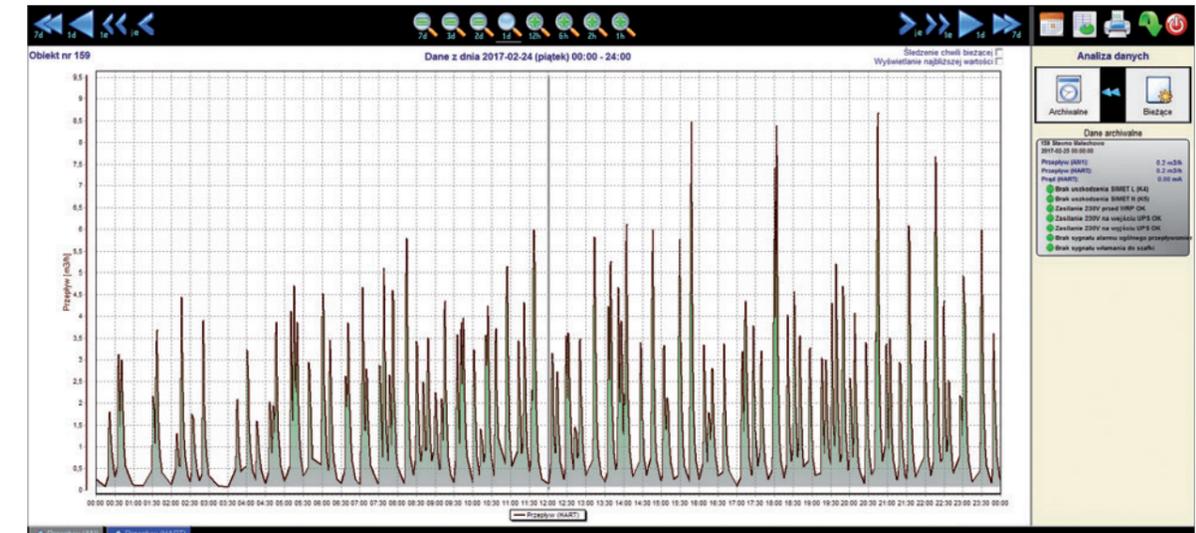
Metering of sewage flow using ABB flowmeters and MT-101, MT-202, MT-151 modules

In 2016, together with ABB, the monitoring of flowmeters installed for billing purposes was continued. Offering the ABB flowmeter in a packet along with a monitoring system, which is additionally

equipped with dedicated modules to verify the accuracy of the indications and generate balance sheets, minimizes the possibility of conflict in relationships between sewage donor and recipient.

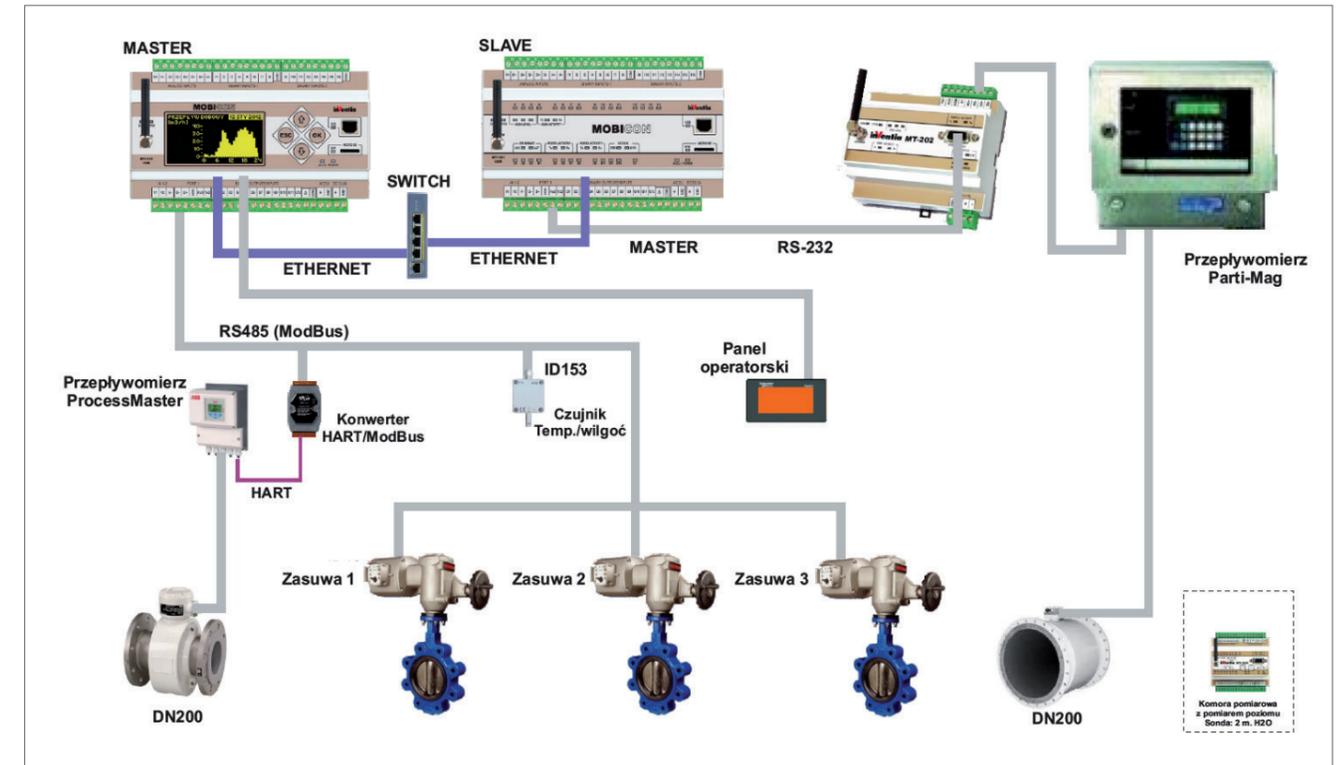
In the first picture below an example of monitoring the sewage flow on a sewer collector connecting two municipalities is shown. Data from the flowmeter is read by the MT-101 telemetry module using digital protocol, then sent to the database server and shared to both parties.

On the second screenshot below there is an example of a flow monitor in a measuring chamber equipped with an ABB flowmeter (PROCESS MASTER model), a HART2ModBus RTU protocol converter, and an MT-101 module. Due to billing purposes, the power supply and telemetry cabinet is equipped with a UPS.



Measurement of sewage flow on transit pipes using ABB flowmeter, MT-202 and MT-151 modules

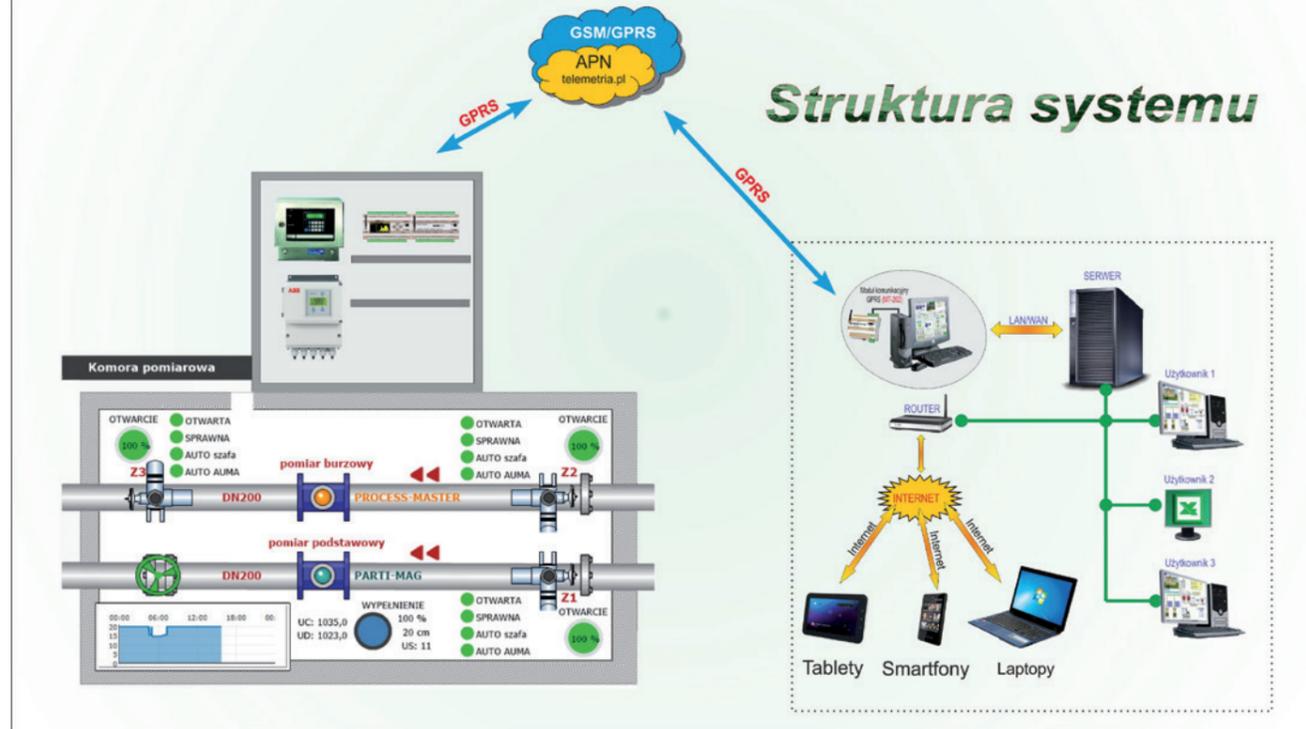
Measurement of sewage flow, especially in cross-site settlements, requires the use of precision measurement systems, consisting of accurate and professional measuring equipment and a remote monitoring system to control the measurement process. In 2016, CONTROL SYSTEM engineers have implemented an advanced system for measuring sewage flow in the transit pipes. Due to ABB's specialized flowmeters and the designed hydraulic system, it has been necessary to implement extensive flow analysis and gate control in the system to ensure the possible highest accuracy of the measurements. Due to the complexity of the control system, the number of signals forced the use of two MT-151 modules. In order to improve the data exchange reliability, the MT-151 modules are additionally connected to each other with the ETHERNET bus.



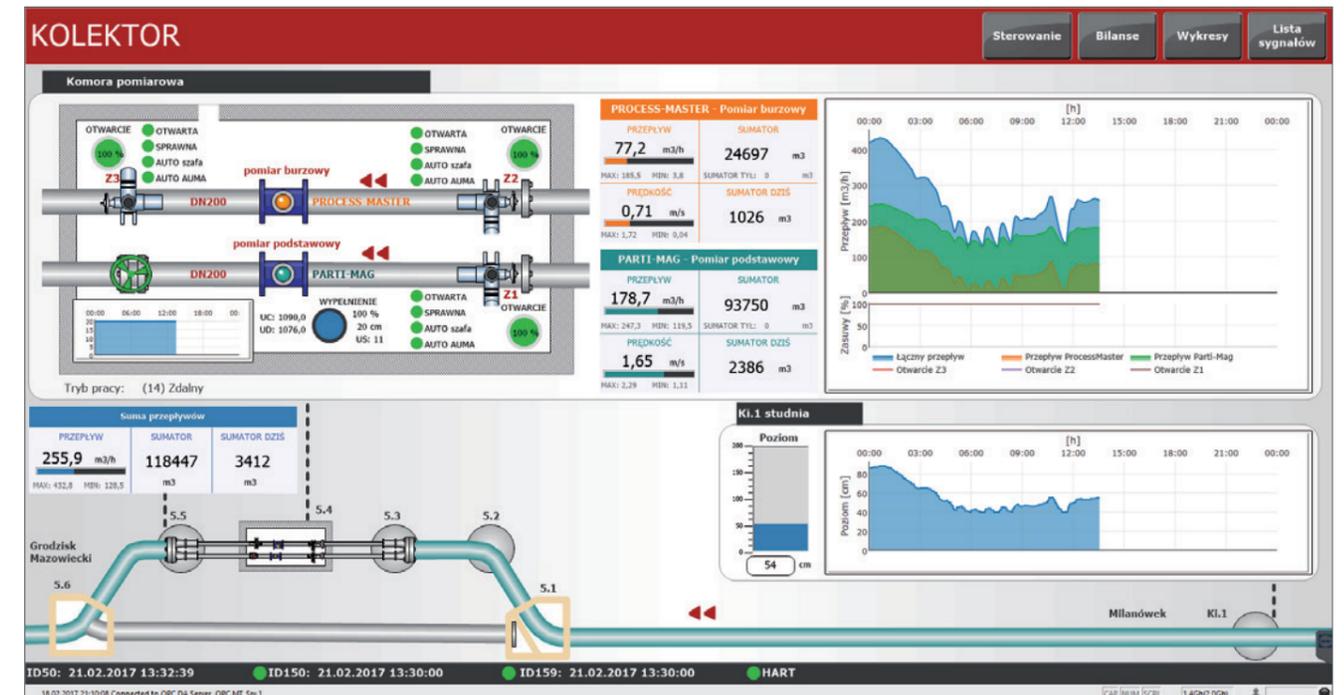
The diagram above illustrates the communication capabilities offered by MT-151 telemetric modules.

The measurement process has been visualized in a dedicated application created in the Movicon SCADA environment by PROGEA. Below the screenshot from the visualization system is shown.

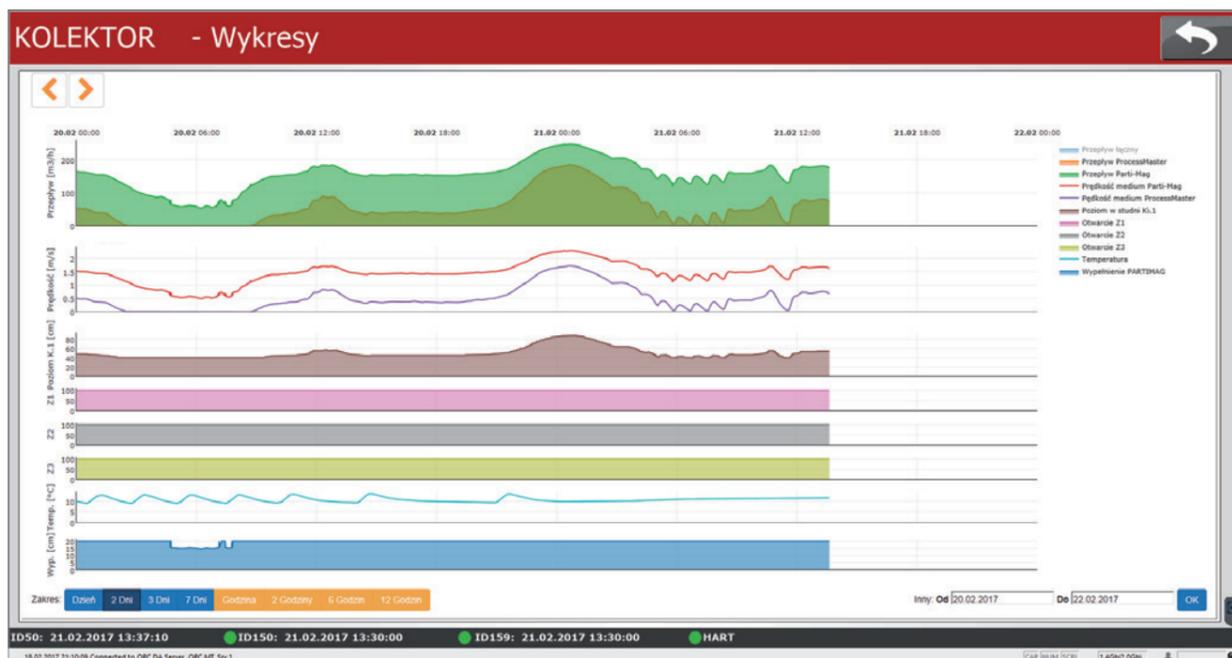
Inteligentny system monitorowania komory pomiarowej w trybie on-line z wykorzystaniem technologii GPRS/3G i INTERNETU



Dedicated applications for MT-151 modules have been developed for control of the measurement process. Each module performs a part of the process, and data between modules is exchanged over the Ethernet bus and additionally are using redundantly the wireless GPRS technology.



Detailed flow charts.



User-specific hourly, daily, weekly, monthly, annual, or operator-defined balances.

Data	Przyrost sumatora przepływu ProcessMaster [m3]	Przyrost sumatora przepływu Part-Mag [m3]	Przyrost sumatorów łącznie [m3]
1 2017-02-20	994	3403	4397
2 2017-02-19	997	3396	4393
3 2017-02-18	1287	3881	5168
4 2017-02-17	1078	3468	4546
5 2017-02-16	621	3152	3773
6 2017-02-15	597	3143	3740
7 2017-02-14	595	3143	3738
8 2017-02-13	614	3173	3787
9 2017-02-12	823	3249	4072
10 2017-02-11	1003	3362	4365
11 2017-02-10	770	3265	4035
12 2017-02-09	766	3265	4031
13 2017-02-08	766	3231	3997
14 2017-02-07	764	3201	3965
15 2017-02-06	759	3236	3995
16 2017-02-05	1006	3348	4354
17 2017-02-04	1100	3404	4504
18 2017-02-03	780	3259	4039
19 2017-02-02	711	3230	3941
20 2017-02-01	741	3260	4001
21 ŁĄCZNE	16772	66069	82841

In the described visualization application created in SCADA system, the so called dashboards are used to present the substantial data for the user.

Adres rejestru	Nazwa	Wartość
118	Otwarcie Z2 [%]	100
119	Otwarcie Z1 [%]	100
120	PMAG przepływ [m3/h]	107,2
121	PMAG przepływ [m3/h]	197,4
122	Wejścia I	-2115
123	Wejścia Q	-32768
124	Wyciek Q	0
125	Mirory	-6112
126	ID159 Poziom kolektora [cm]	59
128	ID150 Wilgotność [%]	0
129	ID150 Temperatura [°C]	0
130	ID150 Otwarcie Z3 [%]	100

MT-331 telemetry module for tank monitoring applications, powered by renewable energy sources

Metering the targets, such as clean water tanks, due to the distance from the low voltage power lines, does not have a 230 V supply voltage and requires battery powered modules or the use of renewable energy sources to supply metering and telemetry equipment. An interesting example is the picturesque reservoir in Zubrzyce area.

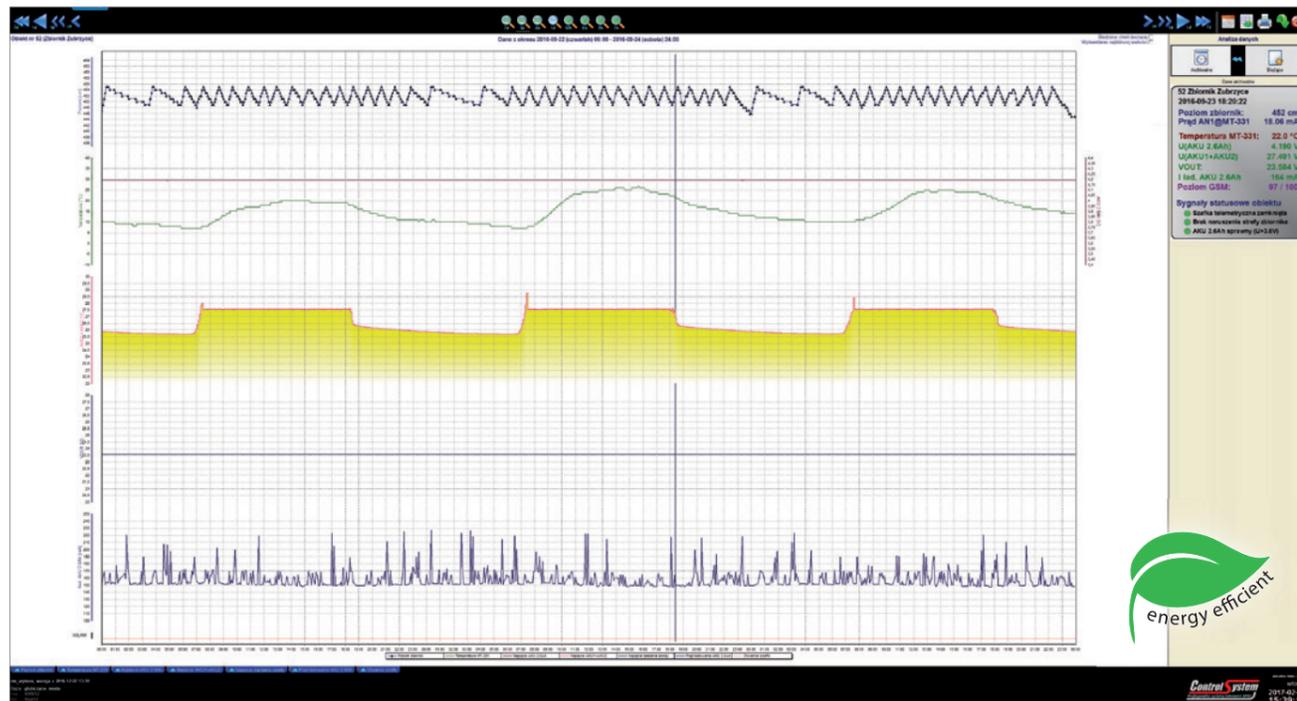
The water level in this tank must be maintained in the upper zone to ensure continuity of water supply to residents. Information on the current water level should be sent to the MT-151 module installed on a remote pumping station, where two pumps pumping water to the reservoir in Zubrzyce. Until August 2016 data transmission was performed by the MT-713 module. The water level measurement cycle took place every 10 minutes. Measurement results were collected in an internal logger of the module, which „wakes up” at every full hour and sends the contents of the buffer to the SCADA system.



The drawback of this solution was the need for periodic battery replacement in the module, which created many problems due to the nuisance of access to the facility, especially during the winter. The board of the company decided to install a photovoltaic panel and to replace the MT-713 module by the MT-331. A special telemetry cabinet with two batteries adopted to use with photovoltaic panel, MPPT regulator and MT-331 module was manufactured.

The result was absolutely satisfactory. The MT-331 module normally operates without power saving mode. Level measurements are made every 5 minutes and sent to the SCADA system and to the MT-151 module in the water pumping station. For two months critical because of the insufficient sunshine, i.e. December and January, there was once no battery discharge to a critical level, causing the receiver to cut off.

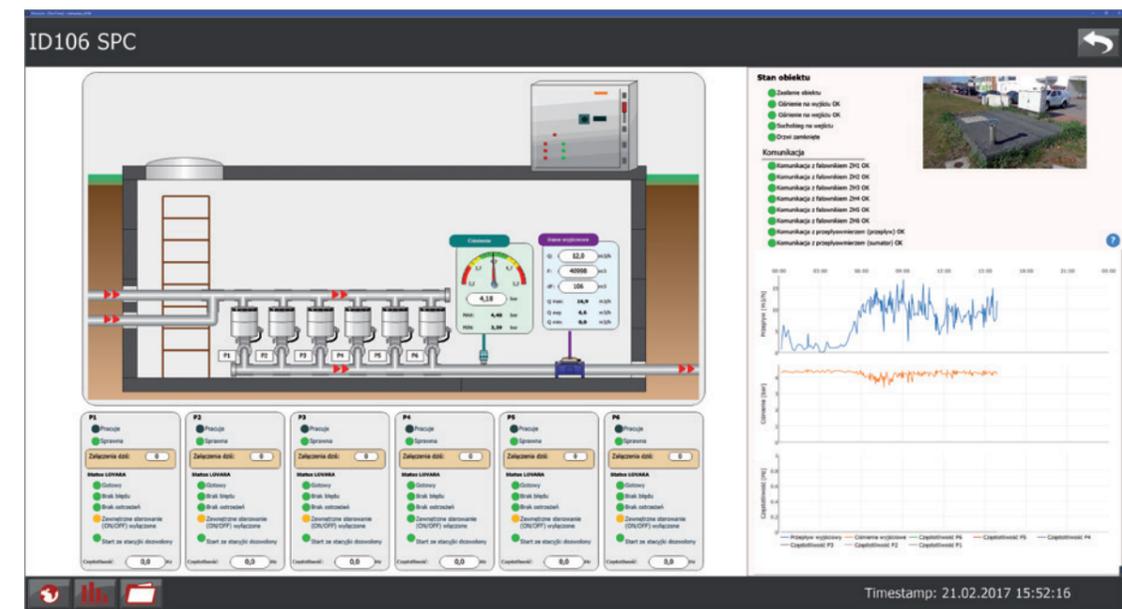
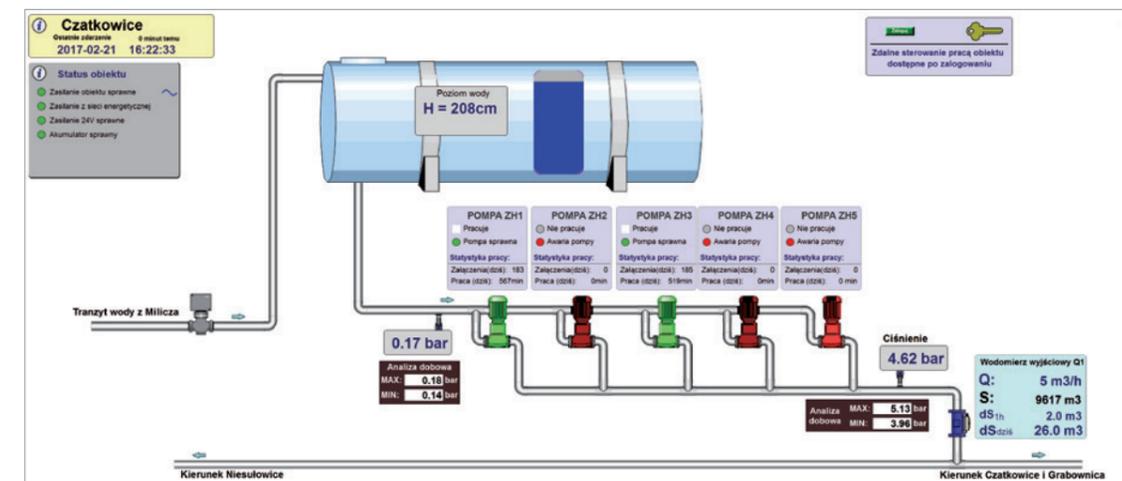
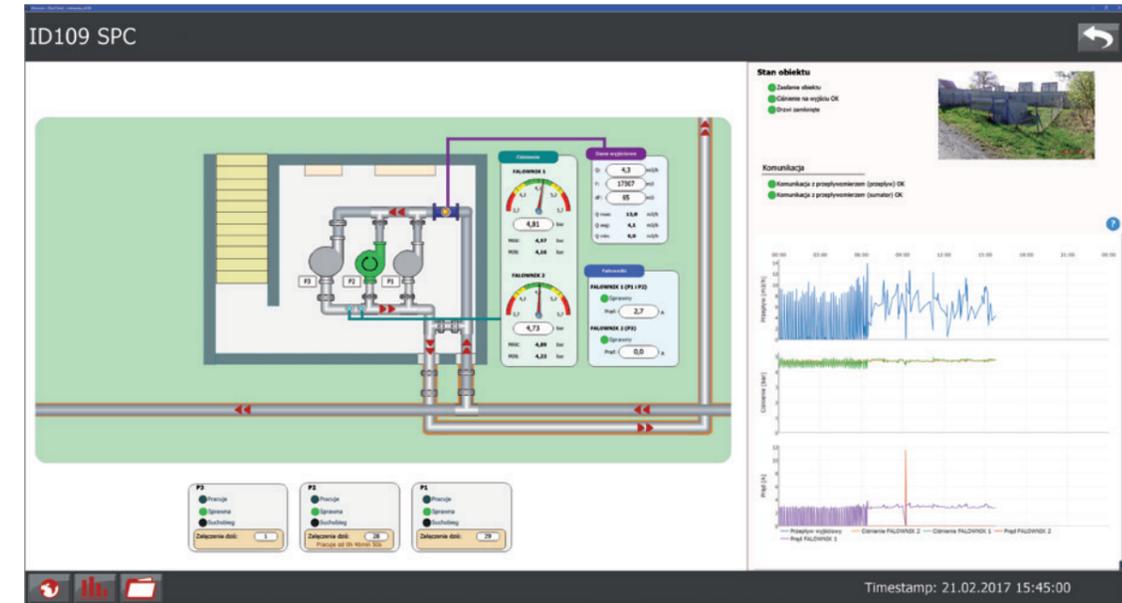
Below are charts showing the course of changes in monitored parameters.



Monitoring of hydrophore sets equipped with their own PLCs using the MT-151 telemetry module

In 2016 a relatively large number of objects included in the visualization system were hydrophore sets. In many applications, CONTROL SYSTEM has incorporated the objects of various equipment levels into the visualization systems. In this area of application, the MT-151 modules have proved to be excellent. Due to the availability of RS-485 and ETHERNET communication ports, in most cases it was possible to successfully create a digital connection with PLC controllers and to transmit data using ModBus RTU or ModBus TCP protocols.

On the next page there are examples of visualization made with the Movicon SCADA system.



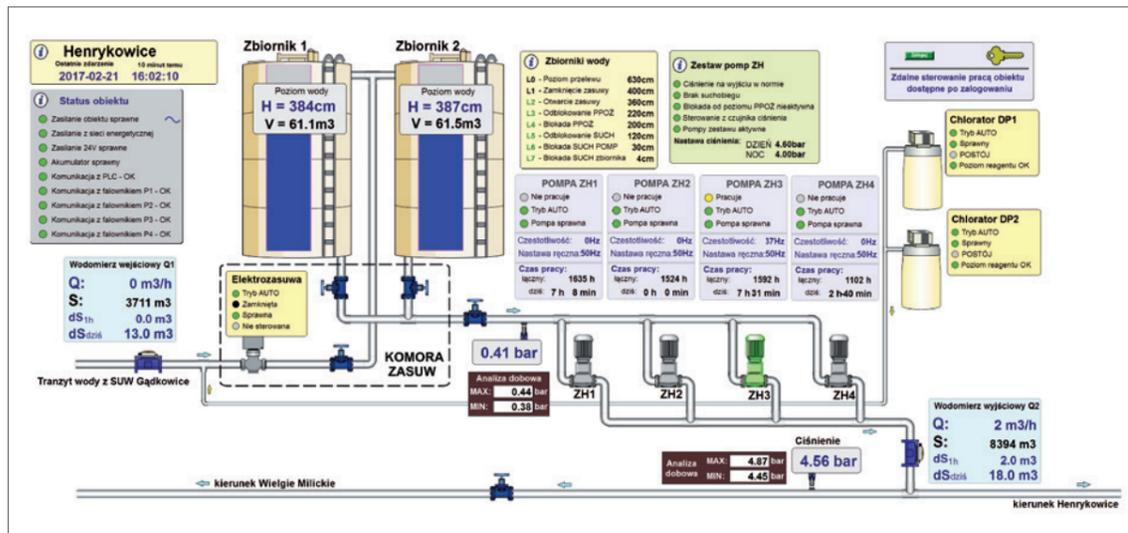
The ETHERNET port is also used in some applications to connect the MT-151 module to the graphics panels.

Monitoring water treatment plant

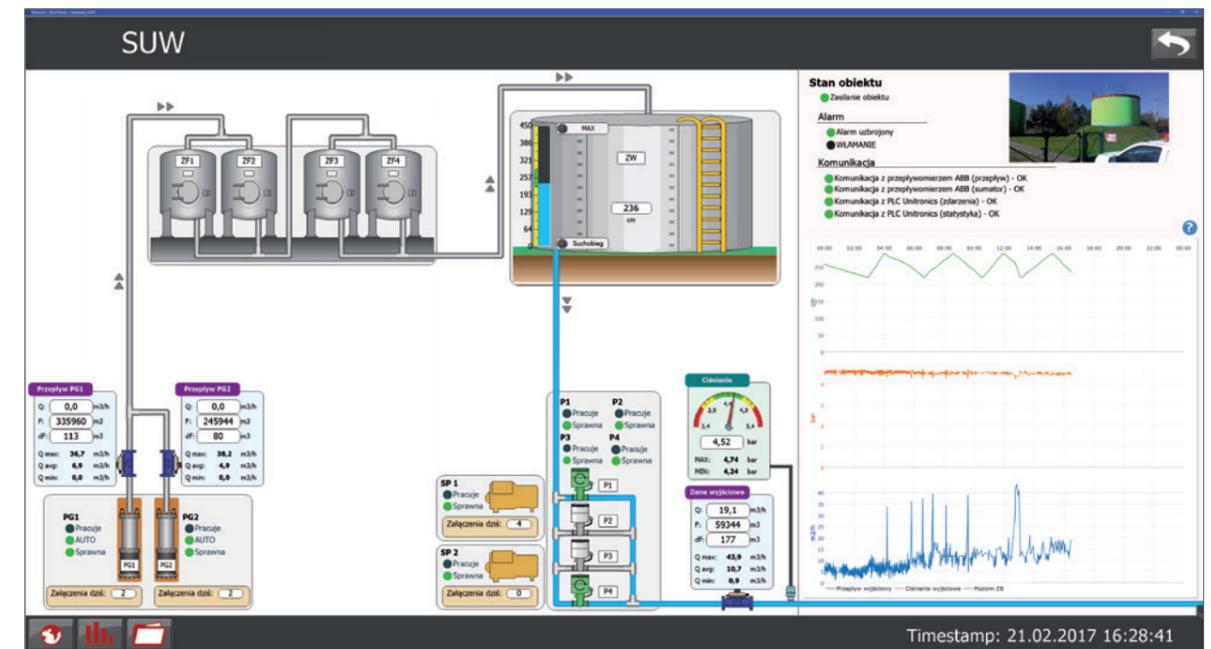
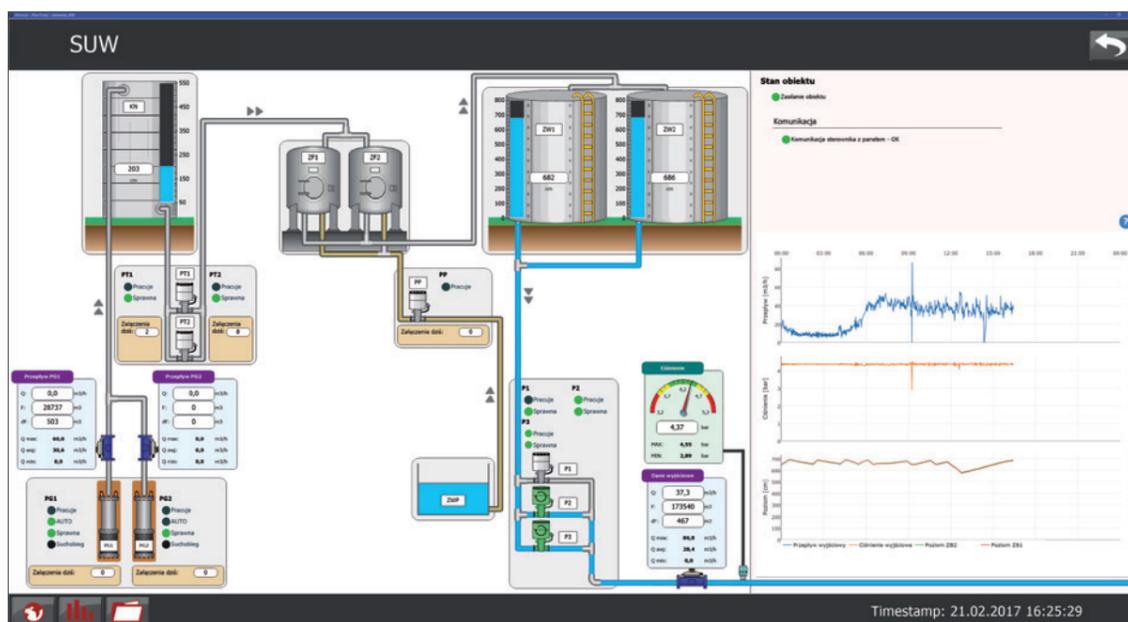
Controlling of small water treatment plants (WTP) based on the MT-151 module is a very cost effective and efficient solution. The ability to remotely debug a control program without entering the facility is a significant reduction in the cost of running a process control. Availability of the ETHERNET port allows you to enable the MT-151 module in your local network and transfer data to the SCADA system without the use of GPRS technology.

For larger stations, the water treatment process is controlled by PLCs that are connected by a digital bus to the MT-151.

Below is an example of a visualization of a water treatment plant operating in the municipality of Milicz.



On the next screenshots, examples of visualization of further WTPs are shown.

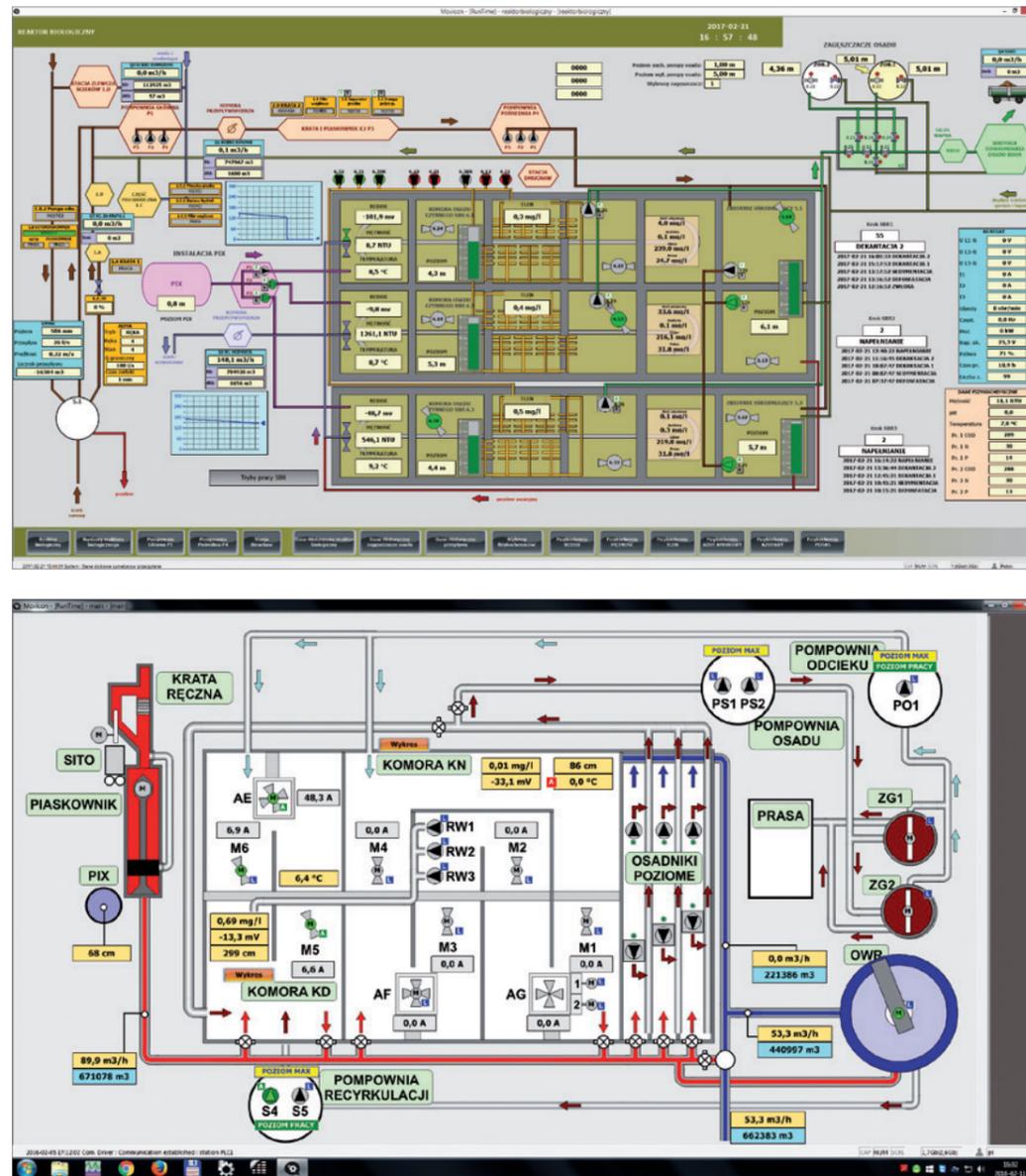


Below is shown the dashboard created in Movicon SCADA system, which readily presents the operator with a summary of the most important parameters of monitored objects and alarm information.



Visualization of the sewage treatment plant made in the Movicon SCADA system by Progea

In 2016, the visualization systems of sewage treatment plants were developed using the Movicon environment distributed by AB-MICRO.



Screenshots above show the examples of visualization of several sewage treatment plants implemented in the Movicon 11.4 SCADA system.

Summary

The year 2016 is a decisive dominance of the MT-151 and MT-251 modules in applications implemented by our engineering team. The functionality of these modules has been consistently developed over the past years allowing the complex control systems implementation. By implementing the new applications, we did not experience any constraints, and in particularly demanding cases, we have combined two MT-151 modules, resulting in a two-processor structure.

Virtually all new implementations of visualization systems have been implemented using Progea Movicon SCADA system, distributed by AB-MICRO. Our engineers have greatly appreciated the opportunities offered by Movicon and its openness to

modifications that allow you to personalize your applications to your expectations. To conclude, the technological level of products offered by Inventia combined with the capabilities of the Movicon SCADA system allow our team to safely meet the next challenges in 2017.



Telemetry system for remote monitoring and control of automated drinking water intakes in Mexico developed by local Inventia distributor – Ingeniería Computacional para el Ser Humano S.A. de C.V. (ICH)

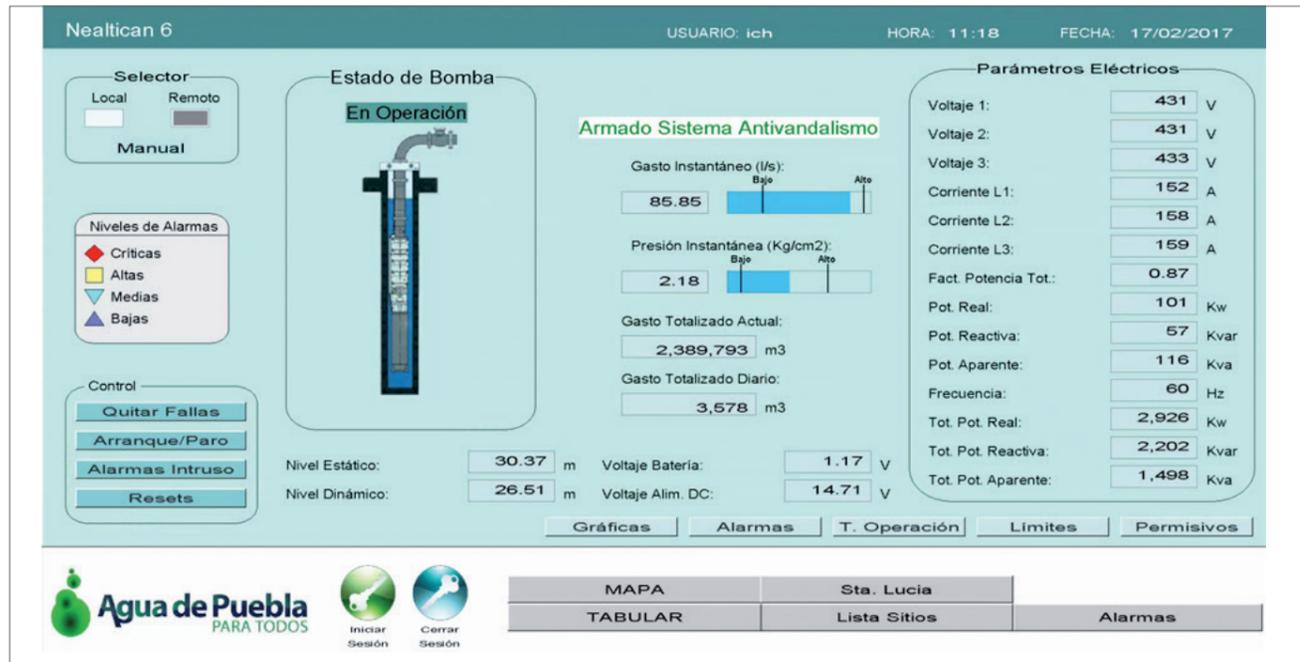
Introduction

The i-Pozo system was designed as a response to the needs of companies collecting and distributing drinking water from local areas scattered across a large area of Mexico. The solution has been focused on the operation of automated drinking water wells for both individual and institutional customers. The heart of the system is i-Pozo RTU telemetry controllers based on the flagship unit of INVENTIA, i.e. MT-151 LED telemetry module. The used telemetry modules with their rich functional capabilities allow to build a modern telemetric system for the management and control of objects using the universal SCADA system. The MT-151 LED and built-in GPRS / 3G communication module are suited exactly to the needs of the local market, providing excellent value for money. The implemented solution, perfectly suited

to the requirements, has strong advantages that provide a competitive advantage over other suppliers in the Mexican water distribution and supply market.

Main tasks of MT-151 LED module:

- Inputs
 - » Constant water pressure control
 - » Measurement of transient flow and total water consumption
 - » Continuous water level monitoring in a well
 - » Detection of unauthorized access to the facility, any abuse or acts of vandalism
 - » Status of pumps and associated equipment
 - » Monitoring voltages, currents, energy consumption, etc.
- Outputs
 - » Remote monitoring of pump operating status
 - » Set pressure and water level values
 - » Sound and light alarm signalling



- Data logger
 - » Measurement data
 - » Alarms
 - » Events
- Communication
 - » Remote, using GPRS packet data transmission to transmit object data to the SCADA system located in the control room. Communication is done through cyclic, asynchronous polling of objects as well as on the grounds of the event work on the basis on generated alarms and events.
 - » Access to the system from the local Wi-Fi access points

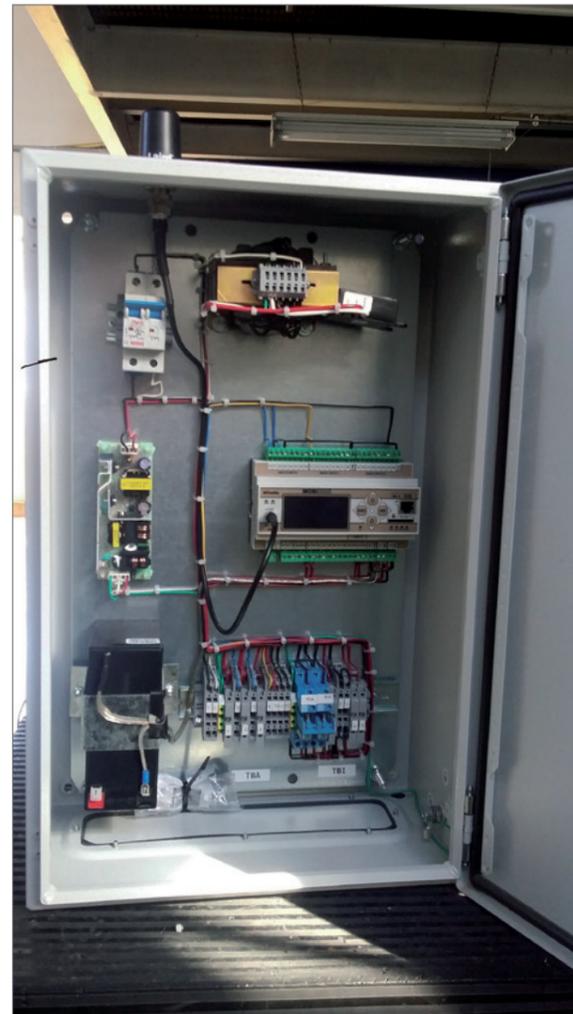
Integration

The single i-Pozo system consists of the following components:

- MT-151 LED telemetry module manufactured by INVENTIA
- Energy meter with Modbus communication protocol
- Inverter with Modbus communication protocol
- Flowmeter with Modbus or HART communication protocol, depending on design
- Pressure and level sensors with 4-20 mA output
- Router providing Wi-Fi communication (Access Point)

Operating mode

I-Pozo RTU performs local work in unattended mode, in accordance with the programmed workflow algorithm. Additional parameters such as the pump operating schedule, alarm thresholds for pressures and flows, etc. can be transmitted remotely using GPRS / 3G packet transfer from the SCADA system.



SCADA

I-Pozo RTU communicates bi-directionally with SCADA central system using GPRS transmission. ControlMaestro software was selected for this task. The link between the telemetry modules and the SCADA system was ensured by communication driver MTDData Provider, delivered free of charge by INVENTIA. In order to handle current data, the OPC (client-server) standard was used. In the case of historical data from the loggers, the driver feeds directly the relational database, thus completing the history of the measurement.

The SCADA visualization system provides several basic functions:

- Real-time monitoring of variables
- Remote command output (start / stop the pump, activate / deactivate the protection system)
- Presentation of measurement data on charts, including live communication as well as the use of local data logger functionality built directly into the MT-151 LED telemetry module.
- Remote setting of configuration parameters and driver settings

Data logger

Many objects are located outside the urban areas, and therefore the range of the GSM signal is weaker, which often affects significant deterioration in transmission parameters. One of the most important features of the system is the possibility of local data archiving. When a GPRS communication is broken or the terminal is not logged to the GSM network, the telemetry module

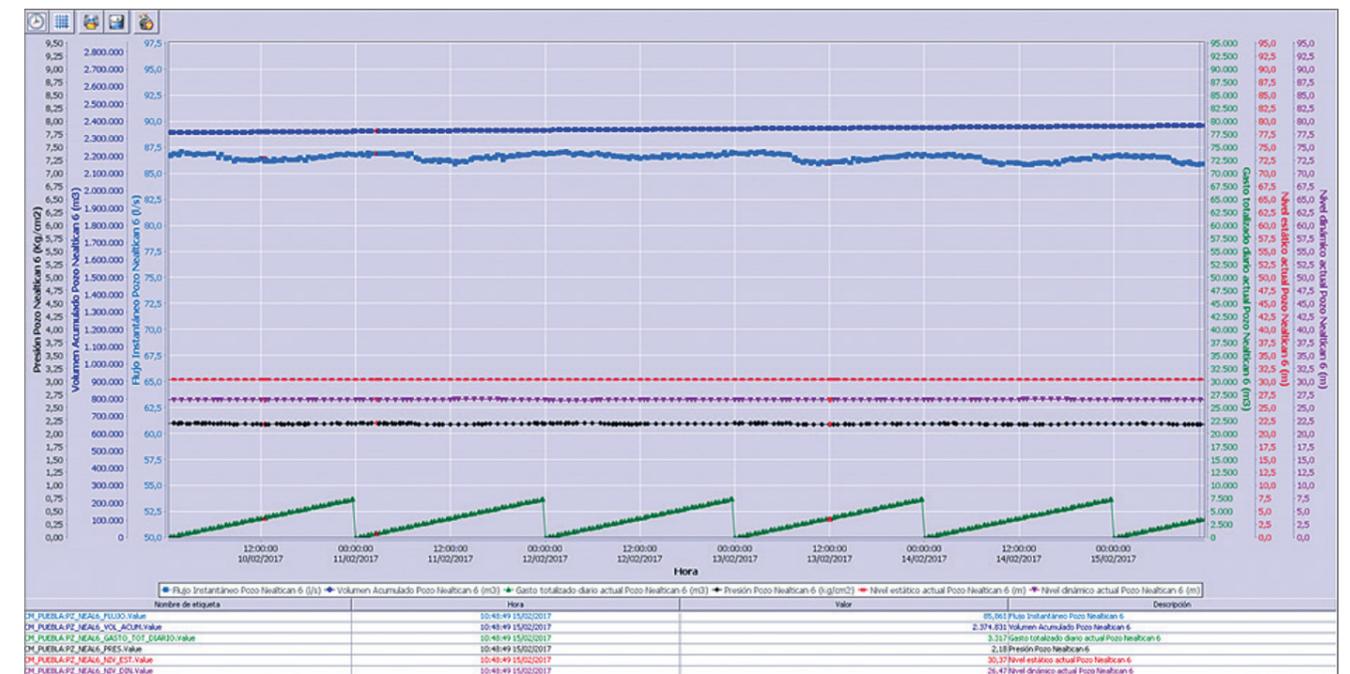
records the measurements in the internal memory and recovers them when the communication with the central station is restored. Then the procedures developed by the ICH enable the presentation of archival data using the time stamp associated with the moment of measurement, alarm or event. This preserves the integrity and continuity of the measurements provided by the object.

Access control

ICH has designed a complete access control system for the individual premises of the facility based on MT-151 HMI telemetry modules. Activation and deactivation of the security system can be performed remotely through the service personnel from the SCADA control center. Additionally, object administrator can issue commands from a shared application installed on operating systems supported by smartphones and tablets. The program communicates with i-Pozo RTU using a local Wi-Fi network. All actions performed by the service are recorded in the system allowing the subsequent verification.



Automatizando Soluciones



Telemetry modules in Middle Kingdom (China), Pipeguard by Håkan Klarin



The Swedish company PG Monitoring System AB, with years of experience in monitoring district heating networks in the domestic market, has been using Inventia's telemetry solutions for many years. Last year, they made their first project in the People's Republic of China.

The project is the result of a number of presentations and demonstrations performed by Pipeguard over the past few years for companies involved in the production, distribution and collection of heat in several major cities in China. In Baotou city located in the northern part of China the first plant that produces heat energy using environmentally friendly solutions was built. Water is heated by the energy from the Sun through using a large network of solar panels and from wind farms. In this project Pipeguard was responsible for implementing a monitoring system for pipes and nodes used in heat distribution.

The People's Republic of China does not shy away from pro-ecological solutions. The picture above shows a street lighting system using solar panels as an energy source.

„As a provider of advanced surveillance systems dedicated to monitoring district heating networks, we have provided our Chinese partners with a fully scalable leakage control and moisture alarm system inside the pipe insulation,” said Håkan Klarin, CEO of PG Monitoring System AB.

When the system detects the smallest leak (up to several centimeters of leakage occurring in the vicinity of the measuring point at a distance of up to 4000 meters of pipe), an alarm is triggered and information about the incident is sent to the surveillance and maintenance service staff. In addition, data is stored in the Pipeguard Web System (PGWEB), and is accessible from any location via the Internet using popular WWW interface.



The microPG telemetry module for collecting data from distributed set of points in heat network has been designed and is currently produced in close co-operation with Inventia. On the basis of this cooperation, several OEM solutions have been created in the past for PG's needs, which up to date have worked seamlessly on many customer systems. Additionally, based on the wide range of standard equipment from Inventia, Pipeguard can meet almost all customer needs for remote surveillance. Customers receive solutions that present differential pressure, flow temperature on input and output of pipe, flood levels, insulation leakage detection, and other parameters of the heat nodes.



At present, Pipeguard can boast references in which PGWEB system is used by customers of six capitals on different continents, from Los Angeles to Beijing. Scandinavia remains the largest market for our Swedish partner. „The clear growth in demand and orders received from China is extremely welcomed and allows us to look with optimism to the future. At the same time, we feel a huge boost that drives us to work. Our previously executed projects meet with great appreciation and customer satisfaction. There is no better reward than full customer satisfaction”, adds Håkan Klarin with pride.



Comparison table of telemetry and localization 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 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						
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						
Data packet sending	YES	YES ¹⁰⁾	YES	YES	YES	YES	YES
SMS sending	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						
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						
SIM cards	SIM/MIM	SIM	SIM/μSIM/ MIM	SIM	SIM	SIM	2xSIM/MIM
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 – 36
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/-						
Rechargeable battery int./ext.	ext.	-	-	-	-	-	ext.
Internal battery supply	-	-	3/6/9xR20	-	-	-	-
Low power operation modes	-	-	YES	-	-	-	-
External antenna connector	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						
DIN rail mounting	YES	YES	-	YES	YES	YES	YES
Warranty	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 Telemetry Module	MT-202 Telemetry Module	MT-251 Telemetry Module	MT-331 Telemetry Module	MT-512 Telemetry Module	MT-651 Telemetry Module	MT-652 Telemetry Module
FEATURES							
I/O Resources							
Binary inputs	16 – 28 ¹⁾	-	0 – 2	0 – 8 ¹⁾	8	2	2
Binary outputs	0 – 12 ¹⁾	-	1	0 – 4 ¹⁾	2	2 ²²⁾	2
Counter inputs	0 – 4 ¹⁾	-	-	0 – 6 ¹⁾	8	-	-
Analog inputs	6	-	-	0 – 2 ¹⁾	-	6 ²³⁾	6 ²³⁾
1-wire input	-	-	-	1	-	-	-
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES	YES
Ethernet Port	YES	-	YES	-	-	-	-
Serial port RS232/422/485	2(1/0/1/1) ⁸⁾	2(2/1/1/0)	2(1/0/1/0)	-	1(1/0/1 ⁸⁾ /0)	1(0/0/1/0)	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	1024	5000	-	-	-	-
Standard serial protocols	YES ⁵⁾	YES ⁵⁾	YES ⁵⁾	-	YES ⁸⁾	YES ⁵⁾	YES ⁵⁾
Data packet routing	YES	YES	YES	-	-	-	-
Manual alarm setting for analog inputs	-	-	-	-	-	YES	YES
Number of analog input alarm levels	4	-	-	4	-	6	6
Remote read/write with SMS	YES	YES	YES	YES ¹⁶⁾	YES	YES	YES
Access control ⁶⁾	YES	YES	YES	YES	YES	YES	YES
Local mirroring of external resources	YES	YES	YES	-	YES	-	-
Datalogger	YES	YES	YES	YES	YES ⁸⁾	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	YES
Other							
Integral GSM/GPRS modem	YES	YES	YES	YES	YES	YES	YES
SIM cards	2xSIM/MIM	SIM	SIM/MIM	SIM/MIM	SIM	2xSIM	2xSIM
3G network support	YES ⁸⁾	-	YES	YES ⁸⁾	-	YES	YES
Integral GPS receiver	-	-	-	-	-	YES	YES
Integrated sensor T/H/P	T	-	-	T/H ⁸⁾ /P ⁸⁾	-	T	T
DC power supply (V)/solar panel (PV)	10,8 – 36	10,8 – 36	18 – 55	9 – 30/PV	9 – 30	7 – 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/-	-	-
Rechargeable battery int./ext.	ext.	-	ext.	int.	-	-	int. ²⁰⁾
Internal battery supply	-	-	-	-	-	YES	-
Low power operation modes	-	-	-	YES	-	YES	YES
External antenna connector	YES	YES	YES	YES	YES	YES	YES ²¹⁾
Protection class	IP40	IP40	IP40	IP40	IP40	IP65	IP65
Operating temperature range (°C)	-20...+65	-20...+65	-20...+60	0...+55 ¹⁹⁾	-20...+55	-20...+55	-20...+55
Removable terminal blocks	YES	YES	YES	YES	YES	YES	YES
DIN rail mounting	YES	YES	YES	YES	YES	YES ⁸⁾	YES ⁸⁾
Warranty	3 years	3 years	3 years	3 years ¹⁷⁾	3 years	3 years	3 years
Built-in device	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 GPRS

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

Comparison table of telemetry and localization modules, expanders and converters

MODULE	MT-713 Telemetry Module	MT-713 v.2 Telemetry Module	MT-723 Telemetry Module	MT-723 PT Telemetry Module	ML-231 Localization Module	ML-931 Localization Module	EX-101 Expander
FEATURES							
I/O Resources							
Binary inputs	5	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⁾	5 ³⁾	2 ^{1,2)}	–	8 – 16 ^{1,2)}
Analog inputs	3	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 ⁹⁾	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 ⁸⁾	YES ⁸⁾	–	–	YES	YES ⁸⁾	YES ¹¹⁾
Data packet routing	–	–	–	–	–	–	–
Manual alarm setting for analog inputs	–	–	–	–	–	–	YES
Number of analog input alarm levels	4	4	4	4	4	–	6
Remote read/write with SMS	YES ¹⁶⁾	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	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	SIM/MIM	SIM/MIM	SIM	SIM	SIM/MIM	SIM	–
3G network support	–	–	–	–	–	–	–
Integral GPS receiver	YES ⁸⁾	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)	9 – 30 ⁸⁾	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⁾	0–5/15 ⁸⁾ /24 ⁸⁾	0 – 5	0 – 5	–	–	–
Power supply monitoring input	YES/–	YES/–	YES/YES	YES/YES	YES/–	YES/YES	YES/–
Rechargeable battery int./ext.	–	–	–	–	ext.	–	–
Internal battery supply	3/6xR20	3/6xR20	1xR14 ¹³⁾	1xR14 ¹³⁾	–	YES ⁸⁾	–
Low power operation modes	YES	YES	YES	YES	YES	YES	–
External antenna connector	YES	YES	YES	YES	YES	–	–
Protection class	IP67	IP67	IP68	IP68	IP40	IP54	IP40
Operating temperature range (°C)	-20...+55	-20...+55	-20...+55	-20...+55	-20...+55	-20...+55	-20...+65
Removable terminal blocks	YES	YES	–	–	–	–	YES
DIN rail mounting	–	–	–	–	–	–	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	–	–	–	–	–	–	–

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

