issue 1/19 (12), July 2019
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TELEMETRON

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Precise irrigation
thanks to telemetry
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DATAPORTAL
– SCADA 4.0
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Guide to
telemetry modules
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Lighthouse in Jaroslawiec

TELEMETRY MAGAZINE

dedicated to professional GSM/GPRS telemetry and GPS tracking solutions

TÜV SÜD ISO 9001

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inVentia

Meet You at the Fair

In the first half of this year we took part in:

AUTOMATICON 2019
26-29.03.2019, booth no. D9, hall I, Warsaw EXPO XXI Center, Prądzyńskiego 12/14 Street

Telemetron previous issues

Telemetron previous editions are available in electronic version at www.inventia.pl

English Edition English Edition

Dear Customers,

With great pleasure, we have prepared the next issue of the Telemetron magazine, where we can share with you information about our new projects, solutions, and implementations of telemetry systems, telematics, industrial internet of things (IIoT) and professional monitoring of vehicles and wild animals. Traditionally, you will find examples of applications implemented by our partners who successfully install telemetry modules in places that are often exotic for us: e.g. at the airport in Kenya – at the modernization of a pumping station or in Chile – by performing remote monitoring of water filtration installations. Like every year, Mr. Maciej Sawicki from Control System summarized his new implementations of telemetric systems in the water/sewage industry. Using the MT-151, MT-331 and MT-713 modules, Control System created many interesting applications, including ones for monitoring flows and pressures on water mains. A similar topic is included in the article on the use of MT-151 modules at the MPWiK pumping station in Lębork, Poland. We would like to thank DataLand company for performing a description of the supervision, control and data acquisition system based on telemetry and LTE routers at the Municipal Services Department in Baborów. Telemetry has also been successfully proven in lighthouses, being used for remote diagnostics of navigation lamps. We thank our Partners for the descriptions of implementation! We wish you more successes!

This year, the AB-MICRO company, from which InVentia derives, celebrates its 35th anniversary. On this occasion, President Jerzy Białousz summarized the activities of both companies on the Polish and global market and outlined the strategic directions and new challenges facing InVentia to meet the needs of new, promising fields of telemetry applications such as agriculture, horticulture and fruit farming. Professor Waldemar Treder presents this topic in the article „Telemetry in the Orchard" from the Institute of Horticulture in Skierniewice, authority in the field of irrigation and fertigation of plants.

The current catalog of our products inside this issue has been divided into various application groups to help you choose the right device model. In addition, at the end of the bulletin, we have included a tabular summary of modules divided by resources, functionalities, and auxiliary equipment.

We invite you to read!

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in this issue:

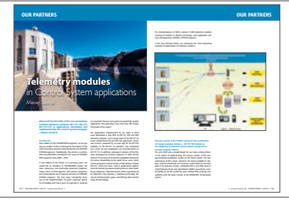
Telemetry for the people of the sea

The Maritime Office in Słupsk was established in 1954 as the Koszalin Maritime Office. Under the current name, it has been operating since 1975. It is one of the three Maritime Offices in Poland – the others are Maritime Office in Szczecin and Maritime Office in Gdynia. ...

More information on page 80.

Telemetry modules in Control System applications

The use of advanced functionality of the new generation telemetry modules MT-151, MT-331, MT-713/723 from InVentia in applications developed and implemented by the Control System company – edition 03'2019. ...



More information on page 82.

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

GAZELE BIZNESU 2017 – Puls Biznesu

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

Diament miesięcznika Forbes 2017

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!

GAZELE BIZNESU 2015 – Puls Biznesu

GAZELE BIZNESU 2014 – Puls Biznesu

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

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

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

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

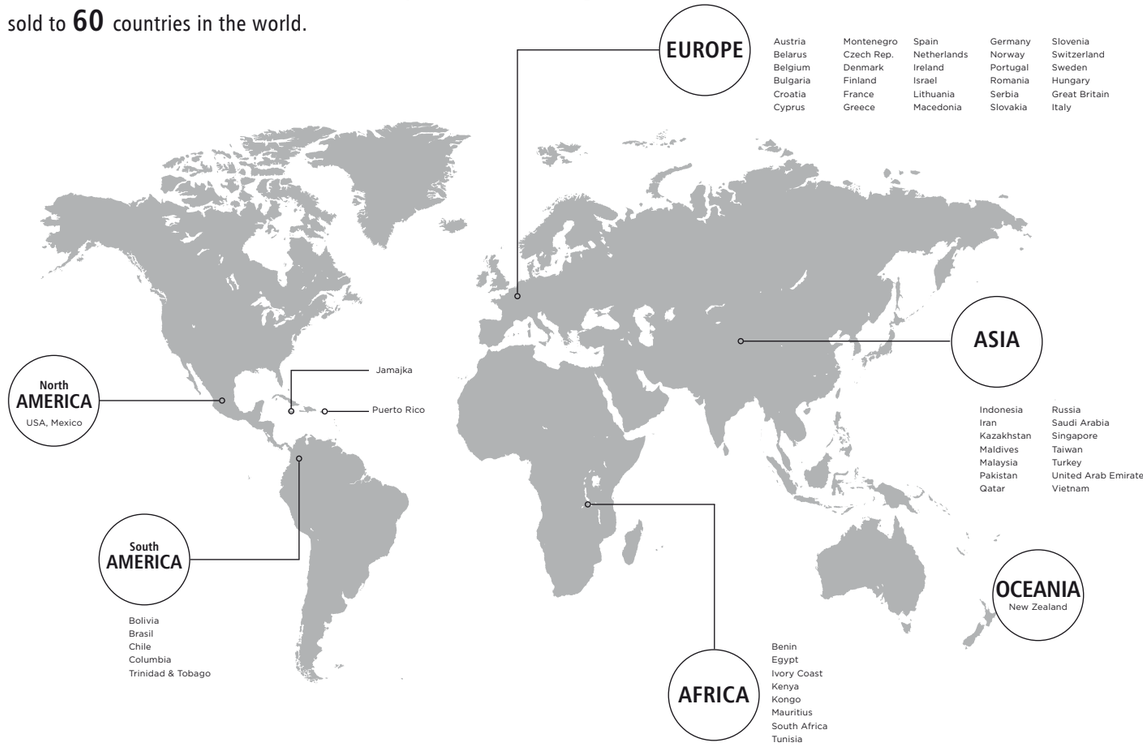
AUTOMATICON Fair 2018

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.

ABOUT US

Our references cover over **100 000** telemetry and vehicle tracking modules sold to **60** 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 100 000 telemetry and locating devices working in Poland and 60 countries worldwide, among them are Austria, Denmark, Sweden, France, Germany, Norway, Finland, Russia, Slovakia, Great Britain, Spain, Israel, Belgium, USA, the Netherlands, Turkey, Thailand, Greece, South Africa, Croatia, Colombia, Mexico, Malaysia, Tunisia, Switzerland, Vietnam, Romania, Mauritius, Taiwan, Chile, New Zealand, Congo, Italy, Hungary and Trinidad and Tobago.

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

ABOUT US

Passion and experience

35 years is a beautiful age!

When I founded in 1984 the company, which gave the roots of today's AB-Micro, I never anticipated that many years later I would be proud of our achievements and the number of our clients will reach thousands. These were completely different times. The year 1984 is only the first signs of normalization of our lives, the emergence of democratic structures, which only a few years later led to democratization and a change in the political and economic system. These changes also affected companies operating on the Polish market, which from small craft enterprises turned into multi-person legal entities that compete with foreign companies. It was similar to us. Initially, a small, craft-based company offering electronic products missing on the market has changed its character becoming a distribution partner of foreign suppliers of automation components, always from the world's top five. This change was necessary. The realignment of the money exchange rate resulted in the sudden opening of international markets and meant the need to compete with global suppliers with an established, long-term position. The transition from our own manufacturing to the distribution of third-party products was, therefore, a must during this period, and it was the only move that guarantees survival on the Polish market which was increasingly hungry of world-class solutions. In this case, the saying that whoever does not change is lost. AB-Micro has changed with the changing realities and market needs. We have repeatedly adapted our offer to the expectations of our clients, we gained new foreign partners, we passed our knowledge to our clients and together with our partners, and we helped in the implementation. However, most importantly, we have expanded the circle of our recipients, based on our professionalism and loyalty to our clients and partners. It paid off. During those years, we have gained the position of a company offering cutting-edge solutions, with well-established expertise, open to the needs of its partners and their clients. This proved very important at the time when predicting the development of market needs, in 1999 we returned to the use of our engineering skills and developed the first telemetric solutions. These were location modules used for monitoring the location of vehicles. The packet data transmission was not available yet, so the only possible form of communication was SMS. However, as soon as the era of GPRS came, being the first packet data transmission technology available in GSM, we were already ready with our solutions for automation. Therefore, it began. Our solutions were well received, after all, they came from AB-Micro. Subsequent modules, next clients, further cooperating companies. Since 2001, when we founded the Inventia company, which took over the AB-Micro activity in the field of telemetry, many solutions have been developed for various applications, including location modules that are ready not only for applications in simple vehicle monitoring. Inventia was the realization of what has matured in all of us over the past few years, i.e. implementation of engineering ambitions and satisfaction with our own passion-created products. Therefore, it is today. Inventia has turned 18 this year. This age obliges, but I am sure, that we have obtained it much earlier.

The Inventia company, which, like AB-Micro, I run from the very beginning, was created by the same people who for many years successfully launched the latest solutions in the field of widely understood Industrial Automation. That is why Inventia products, meeting the majority of customers' expectations, have gained such a good reception on the market of professional applications. The first, fascinating, but very difficult period of activity is not only the development of new products that respond to the changing needs of customers. It is also the education of the market in the field of digital data transmission, convincing about the reliability of the proposed solutions, as well as a competitive fight with suppliers of radio modems who are rapidly losing sales markets.

Currently, the situation is stable. GSM technologies, including the still-used GPRS, but also the latest 3G and 4G, have gained full approval and application in many solutions that require a large territorial range, and are satisfied with the relatively small data flow. Competitive radio modems are still on the market, filling a gap in terms of solutions requiring inefficient transmission using GSM. Undoubtedly, the IV Industrial Revolution, also called Industry 4.0, became the direct driving force behind the development of telemetry, now called IIoT (Industrial Internet of Things). The progressing digitization of our everyday lives must reflect in the way industrial production is carried out, which has long been using digital control and management methods. However, it was only network technologies, the all-encompassing world of the Internet, which allowed for far-reaching integration of data and services, making a legitimate analysis using Machine Learning – one of the fields of Artificial Intelligence. AI (Artificial Intelligence) is the future of our life and work, but AI develops only due to data obtained from the real world. The greater the amount of data to be analyzed, the more precise the learning and the greater the efficiency of the developed algorithms. As you can see, nothing can happen in such conditions without telemetry, i.e. remote data acquisition, regardless of whether it is wired or wireless. Moreover, that is where our products are used, both those that we sell on the domestic market, as well as those exported to more than 60 countries around the world. It is really a great satisfaction and a remarkable distinction that so many foreign recipients who have free access to all global technologies recognize our technical thought. This is a great appreciation for our entire team, which creates such successful and necessary constructions with their work and commitment. We are proud of that.

Telemetry is not only about the industry, and technological progress and digitization of life are not only about industrial production. Changes take place in many areas of life. We saw another development opportunity in agriculture. That is why we are expanding our offer with solutions for obtaining data necessary to carry out the effective agricultural production. Farmers, or rather agricultural producers, operating in the field of fruit-growing, vegetable growing, nursery, forestry, or large-scale crops, are a new group of potential Inventia customers. On the one hand, this is „unknown land" for us, and on the other, a huge, yet undeveloped market of customers so far omitted in the latest technologies. It is a very conscious market, requiring solutions tailored to individual needs, but also very grateful because it is not contaminated with long-term habits. The Agreus system created by us is the result of our cooperation with the Institute of Horticulture in Skierniewice, Poland, and the experience collected there shows how beneficial the marriage of industry and science can be. I encourage you to read the article in this issue describing the experience gained during the eSAD project, financed with the support of European Funds.

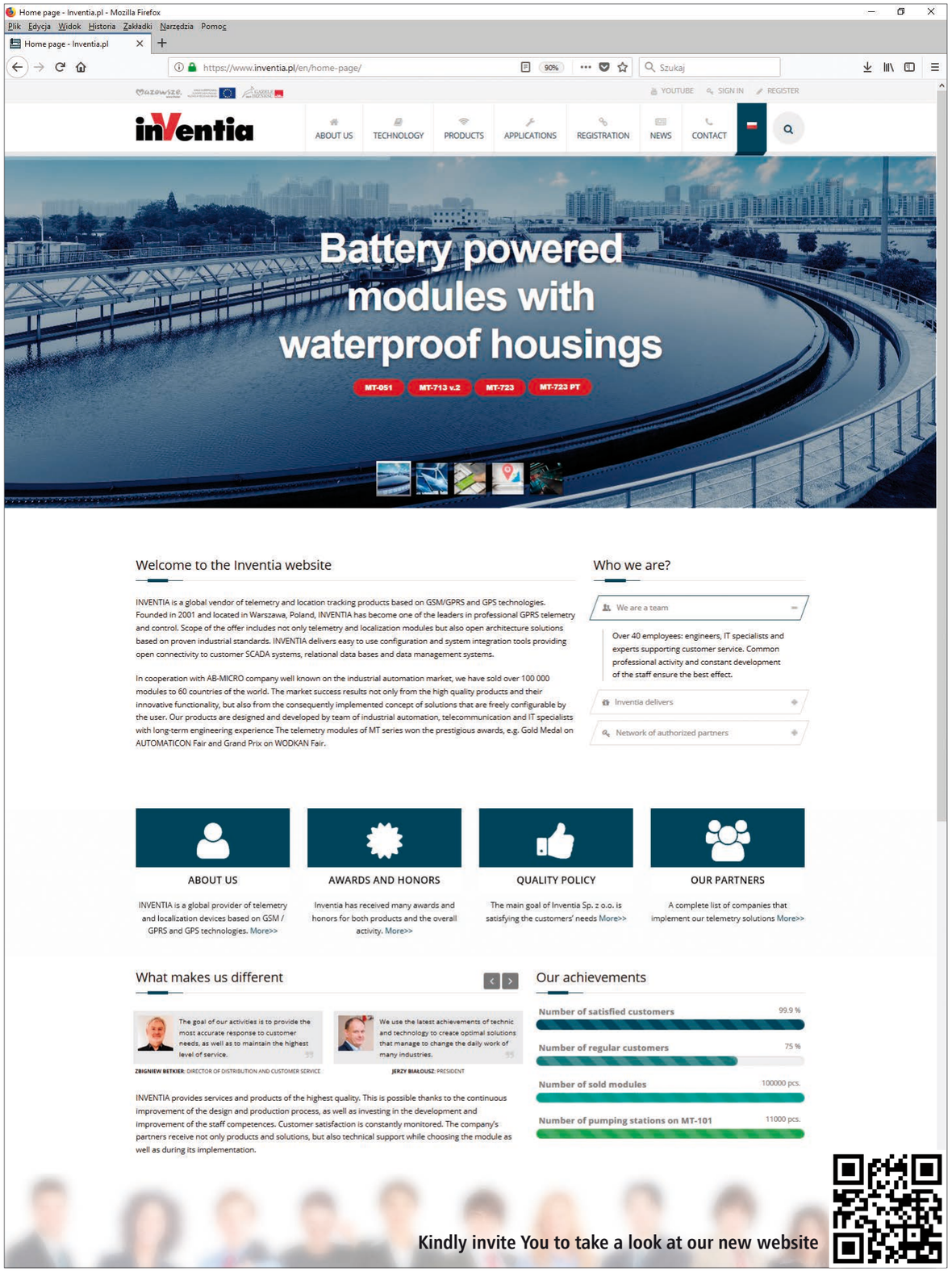
The eSAD project, however, is not just an experience in agriculture. Thanks to the development of sensors and actuators working with the use of LoRa transmission, we have knowledge in a completely new field of communication, perfectly complementing the previously used GSM technology. LoRa technology will enable us to create distributed data acquisition systems requiring a fraction of the power needed for GSM transmission and allowing for battery or solar supply of devices that will be able to operate for years without replacing the power source. This is another important step in the development of our telemetry offer.

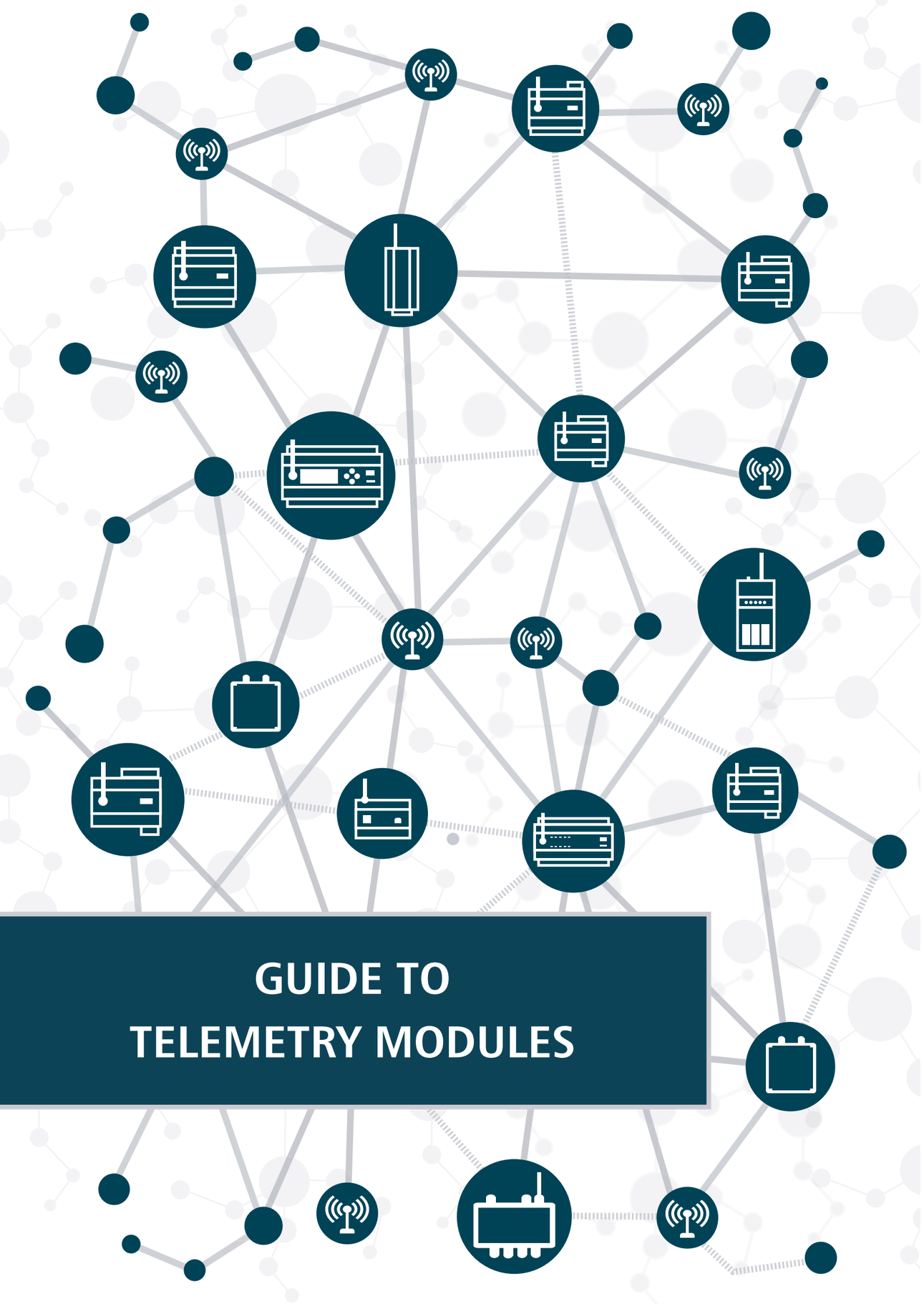
As you can see, we have well-developed data acquisition. So what is next? According to current trends, obtaining data is not enough. Of course, if the client has his own data collection and processing system, our role ends here. However, if this is not the case, then a very important link is missing logically, allowing data to be changed into information. Because what are the data? It is only the set of the numbers without meaning for non-experts. If these numbers are not assigned to specific information, they constitute only a plethora of unnecessary digits. In such a case, there is a lack of change of data into information, which is actually the quintessence of the whole process. It can be perversely stated that basically, no one wants to have a telemetry system, and the only reason for this is the willingness or necessity to obtain information supporting the decision-making process. The information acquired on time, based on current data, is the real goal, not the mere fact of having a telemetry system that transmits data. That is why in our offer we went a step further and developed constantly progressing three Internet portals intended for the visualization and interpretation of data received from our telemetric modules. They allow us to visualize data acquired from location systems, standard modules for automation, and the Agreus system.

The creation of portals, the collection of data subjected to mass processing and correlation search (data mining) and the presentation of information in a way that is understandable to the user is now a global trend, so we are going in this direction. It is also a new way to increase the company's revenues because the competition is not sleeping. As the experience of recent months has shown, with our manufacturing of equipment, we are beginning to reckon with the market. Moreover, not only about 35 or 18 years of experience. Who is now producing equipment, if you can create another, beautiful, application, also for a smartphone, collect data and analyze them at will in the cloud? Who wants to create hardware solutions that are difficult to design and require care during production? Fortunately, we still want it! We remember that without good equipment, nothing will be from the Internet of Things, and the cloud database will shine empty instead of feeding the powerful artificial intelligence algorithms.

Nice to work in the field of such modern, constantly developing technologies...

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 112-115 helps to understand the details.

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

Modules for monitoring and remote control, without programmable logic	MT-020, MT-021, MT-331
Battery powered modules with waterproof housings	MT-051, MT-713 V2 MT-723, MT-723 PT
Modules for monitoring, remote and local control, with programmable logic (PLC) and communication with external devices (not applicable to MT-100)	MT-100, MT-101 MT-102, MT-151 HMI V2 MT-151 LED V2 MT-156 HMI
Gateways with programmable logic	MT-202 MT-251
GPS / GPRS tracking modules	ML-231, ML-931
Special modules for lifts Modules dedicated to cathodic protection	MT-512 MT-651 MT-652
IoT Devices Family – measuring sensors	IoT-RT-01, IoT-RTH-01 IoT-RG-01, IoT-RG-02 Tester IoT
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:

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

DI/DO	Specifies the number of discrete inputs and outputs of the device
AI	Specifies the number of analogue inputs of the device
RTD	Resistance temperature detector inputs
PLC	Device with programmable logic
	Device with a data logger
IP68 IP67	Module with an enhanced IP class
energy efficient	An energy efficient or energy-saving device
	Device with galvanic isolation circuits
DIN RAIL	Mounting on DIN rail
WARRANTY 3 YEARS	Warranty period

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

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

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

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

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

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

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

Typical applications:

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

Resources

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

Functionality

- Two-way communication via SMS and GPRS
- Possibility to send SMS and e-mail messages or GPRS data frame on raise of alarm or according to schedule
- User-defined rules triggering communication (SMS, CLIP calls, e-mail, GPRS data frame) on binary inputs, timers flags, counters flags or registers and internal markers state change
- Binary inputs functionality:
  - configurable input filtering;
  - possibility of counting pulses in a user-specified range (max. 2 147 483 647) and direction (increase/decrease counter value)
- Analog values measurement:
  - temperature measurement with Pt100, NTC or 1-Wire sensors;
  - voltage measurement in 0 – 10 V or 0 – 5 V range;
  - current measurement in 4 – 20 mA range;
  - possibility of linear scaling results of the measurements to engineering units;
  - 4 alarm levels, alarm hysteresis, filtration & deadband parameters defined exclusively for each analog input
- Control outputs functionality:
  - bistable, monostable or toggle output with user-defined pulse duration time and normal state;
  - local control – control output state is changed by events;
  - remote control – output state is changed by writing via SMS/ingoing CLIP call/GPRS data frame value to module register
- Universal Timers functionality:
  - synchronization with internal RTC clock;
  - user-defined counted time range
- Configuration via USB port or from remote using SMS commands
- Dynamic insertion of the variables (e.g. temperature measurement, binary input state) into SMS text messages
- DTMF codes support
- Possibility of setting limits for SMS transmission
- Internal logger – records the history of device operation; capacity up to 48 000 entries
- 12/24V DC accepted power supply
- Reach diagnostic LED set (module status, GSM communication activity, GSM signal strength, binary I/O's state)
- User-friendly configuration tools
- OPC server for Windows

General

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

GSM/GPRS Modem

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

Power

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

Binary inputs I1 – I4

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

Outputs Q1 – Q2

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

Analog inputs AN1, AN2 – voltage measurement

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

Analog/Pt100 input AN1 – temperature measurement

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

Analog/NTC input AN2 – temperature measurement

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

Analog inputs AN1, AN2 – current measurement

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

Backup battery input ACCU

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

* Please check battery specification

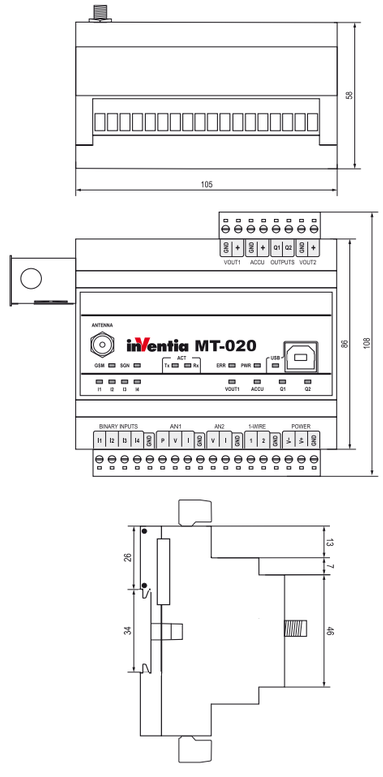
Power output VOUT1 (stabilized)

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

Power output VOUT2 (non-stabilized)

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

Drawings and dimensions (all dimentions 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**

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

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

General

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

GSM/GPRS Modem

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

Power

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

Binary inputs I1 – I4

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

Outputs Q1 – Q4

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

Analog/Pt100 input AN1 – temperature measurement

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

Analog/NTC input AN2 – temperature measurement

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

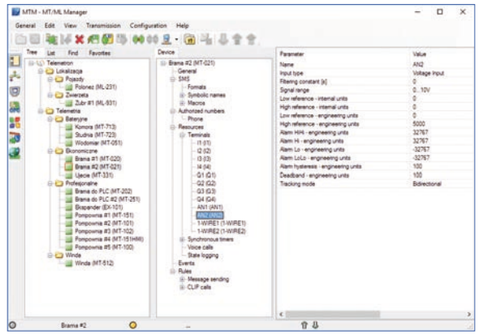
Analog inputs AN1, AN2 – voltage measurement

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.

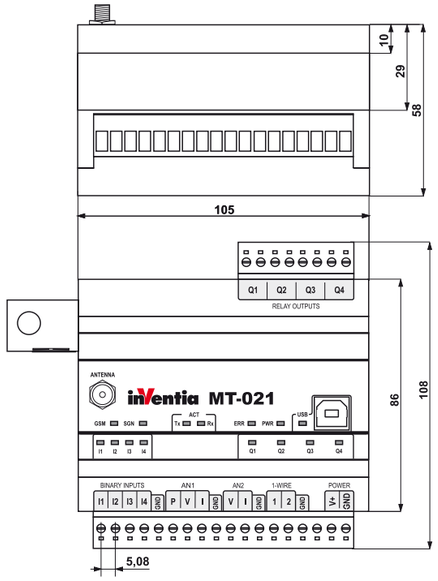
Analog inputs AN1, AN2 – current measurement

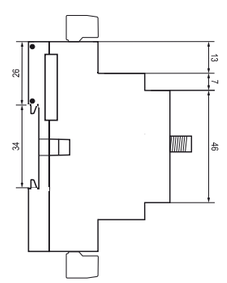
Measurement range	4 – 20 mA
Maximum input current	50 mA max.
Input dynamic impedance	100 Ω typ.
Voltage drop at 20 mA	2 V max.
Accuracy	±1,5 % max.
Nonlinearity	±1 % max.

Configuration environment



Drawings and dimensions (all dimentions in millimeters)





4DI/4DO
2AI
DIN RAIL
MT-021

MT-331 – Telemetry GSM/GPRS/EDGE Module

- **Integral, five band GSM/UMTS modem 800/850/900/1800/1900/2100 (2G/3G) (LTE option)**
- **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**

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:

a. Only MIM card, without SIM
b. Only SIM card, without MIM activation
c. 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)
- 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	9 – 30 V		
Mean input current (for 12V DC without external recipients)	Idle 10 mA	Active 180 mA	Max 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

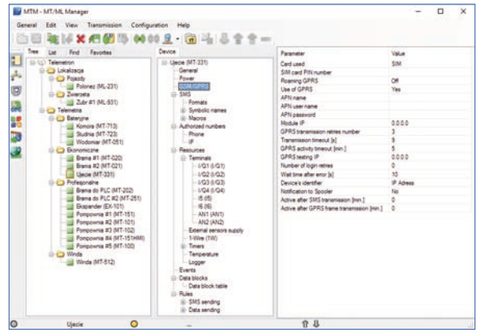
Binary inputs I7 – I8

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

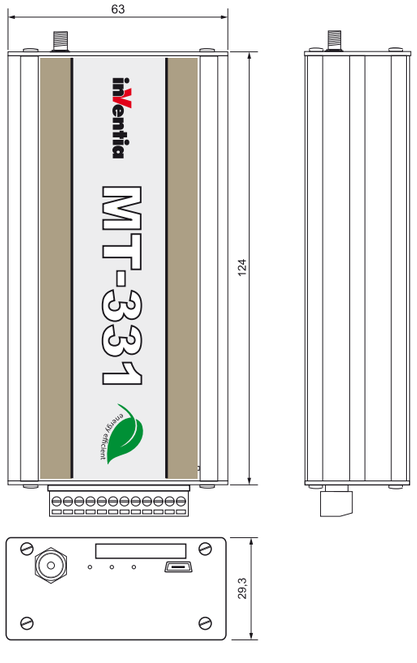
Internal temperature sensor

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

Configuration environment



Drawings and dimensions (all dimentions in millimeters)



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) **MT-051 M** (6 alkaline batteries) **MT-051 L** (9 alkaline batteries)	 75 x 125 x 75 125 x 125 x 75 175 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) **M** size (height of enclosure: 125mm) **L** size (height of enclosure: 175mm)	 3 alkaline batteries, 4.5 V/16 Ah 6 alkaline batteries, 4.5 V/32 Ah 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

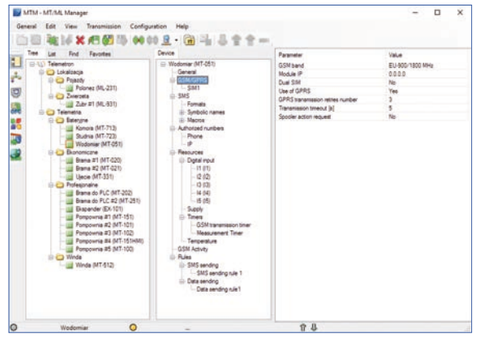
Logger

Memory type	FLASH
Capacity in records	28000

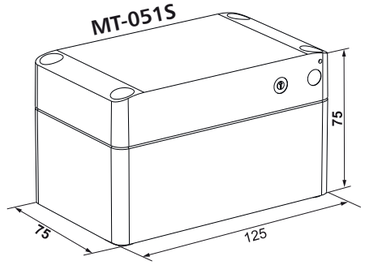
Additional features

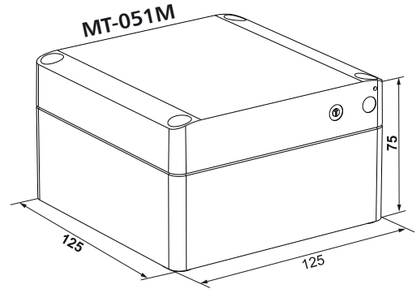
Dual SIM	standard SIM and micro SIM/MIM
Internal temperature sensor	Accuracy: ±1°C @ -25°C do+100 °C
Port for external temperature sensor 1-Wire DS18B20	Accuracy: ±0,5°C @ -10°C do +85 °C ±2°C @ -55°C do +125 °C

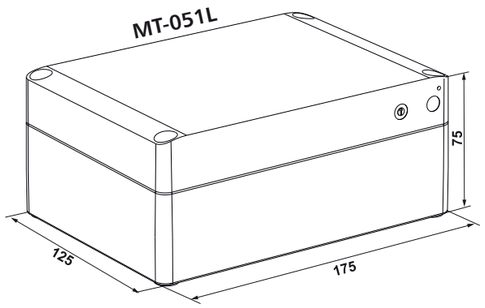
Configuration environment



Drawings and dimensions (all dimentions in millimeters)







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

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

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

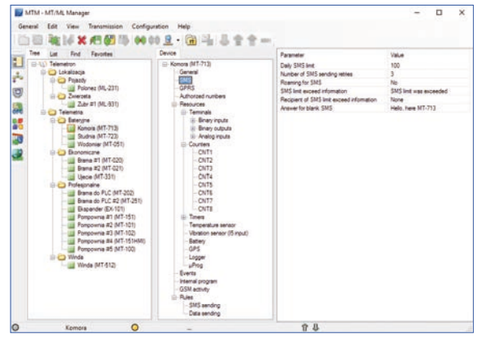
Configurable voltage output

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



Power supply

Battery pack: - 3 alkaline batteries (6 alkaline batteries)* or - 3 lithium batteries (6 lithium batteries)*	 4,5 V/16 Ah (32 Ah)* 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 %

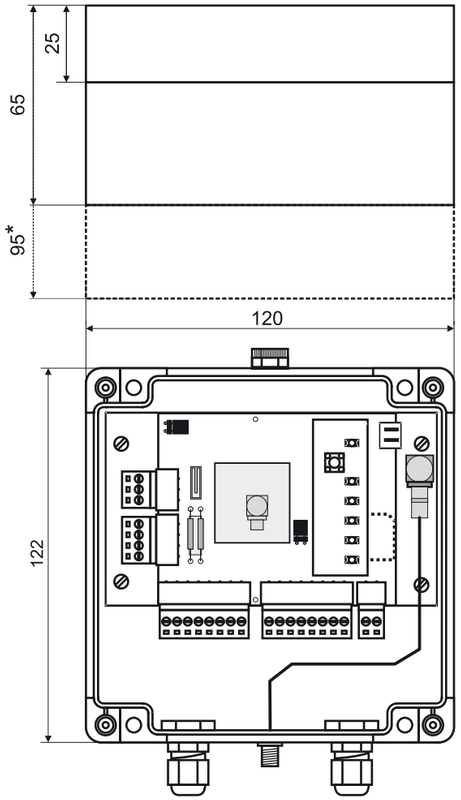
Binary/counter inputs I1 – I5

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

Drawings and dimensions (all dimentions in millimeters)



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

MT-713 v2

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

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

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

MT-723 module is a data logging and transmitting device with the highest degree of protection against harsh external environment. Like other modules from MT family MT-723 module is a cutting edge design characterized by technological advancement, innovative solutions, ease of configuration and integration with data gathering and processing systems. Module has possibility of initiating data transmission (event-driven or scheduled) what helps to minimize the transmission costs and energy consumption, therefore increasing battery life. However it is possible to set up device to stay online permanently or for desired time thus allowing to poll both current, logged or both types of data asynchronously from module. Robust, compact design enclosed in a polycarbonate housing with IP68 protection module allows installation and usage of module in places with harsh environment and without power supply (such as water supply network measuring chambers). The module can be powered from alkaline or lithium battery packs, batteries, solar panels as well as from stationary sources of power. Voltage level of power source is constantly monitored and transmitted together with measurement data. In the case of disconnection of an external power supply internal lithium battery provides power essential for counting pulses on inputs I1 – I6, sustains the RTC clock and triggers power loss alarm. MT-723 module is equipped with 6 binary/counter inputs (supporting potential free contacts used e.g. as pulse outputs of water meters) and three analog inputs for measuring parameters such as pressure, temperature, water level, etc. Keyed voltage source for powering analog sensors which provides power only for a short time needed for measurement and outputs that can be used for controlling external power source powering analog sensors are solutions which, in conjunction with the deactivation of GSM/GPRS modem when there is no data transmission, ensure an extremely low power consumption. Measurement data is stamped with precise time and can be recorded in nonvolatile Flash memory. In addition to measuring functions module can also report states of emergency such as mechanical shock, flooding, unauthorized opening of the chamber, lack of flow, exceeding specified level of flow, pressure, water level, temperature, humidity, etc. Resources and functionality of the MT-723 module can be optimized for specific applications thanks to the many available options (module flooding sensor, pressure transmitter, GPS receiver). The module is supplied with userfriendly configuration environment and communication driver providing OPC, ODBC and CSV interfaces for data reception and the software for remote management via GPRS. User can manage modules from remote via GPRS. Remote management includes firmware updates.

General

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

GSM/GPRS Modem

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

Power

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

Analogue inputs AN1 – AN3 (potential, differential)

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

Binary inputs I1 – I6/counter inputs 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

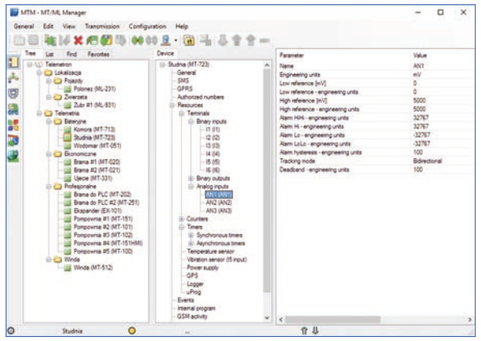
Logger

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

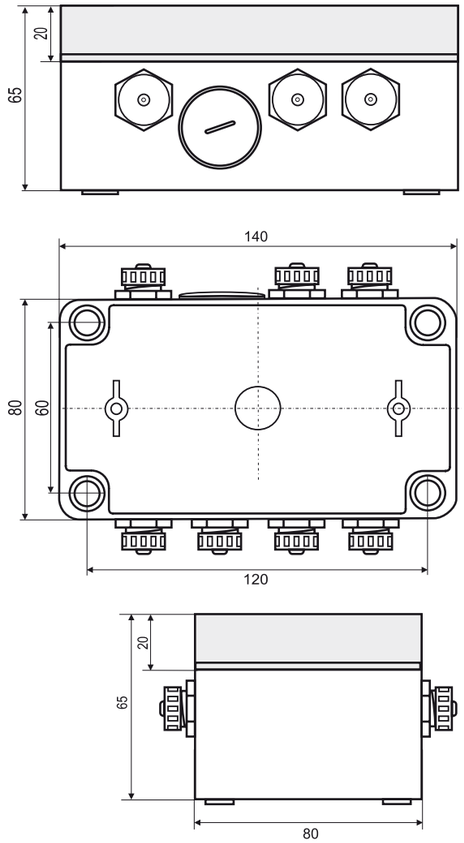
Configurable voltage output

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

Configuration environment



Drawings and dimensions (all dimentions 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 +60°C
- Intuitive, user friendly configuration and communication applications.
- Application for remote control via GPRS network
- Remote firmware updates

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

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

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

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

Measurement data may be registered with precise time stamp in non volatile Flash memory either by schedule or on event.

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

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

General

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

GSM/GPRS Modem

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

Power

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

Analog inputs AN1 – AN3 (voltage, differential)

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

Integrated pressure gauge AN1

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

Binary inputs I1 – I6/counter inputs I1 – I5

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

NMOS outputs Q1, Q2

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

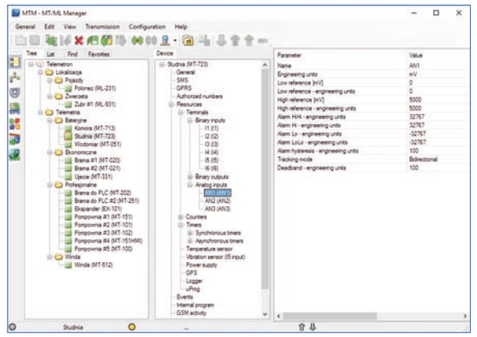
Configurable voltage output

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

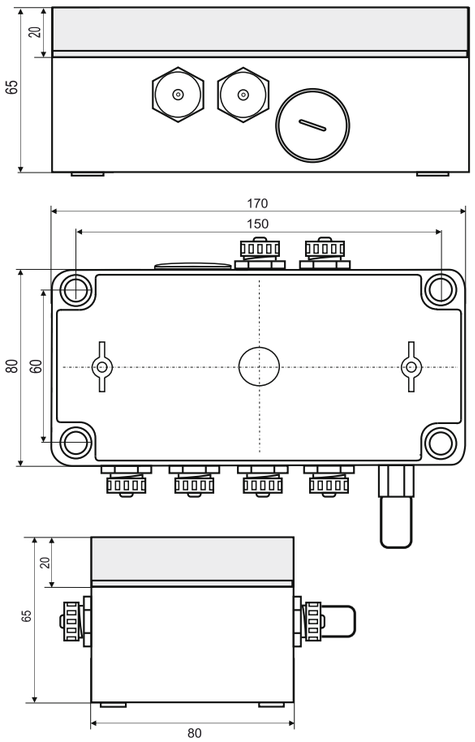
Logger

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

Configuration environment

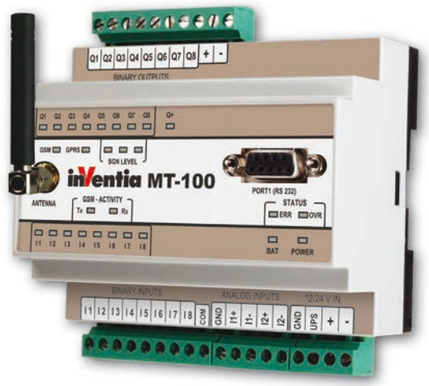


Drawings and dimensions (all dimentions in millimeters)

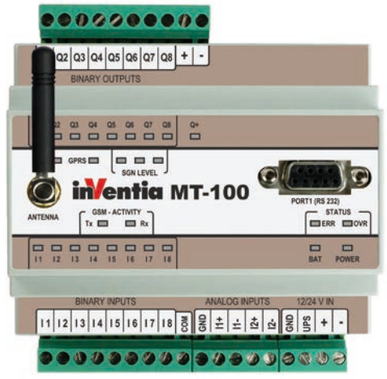


MT-100 – Telemetry module for on-line monitoring and local control

- 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.

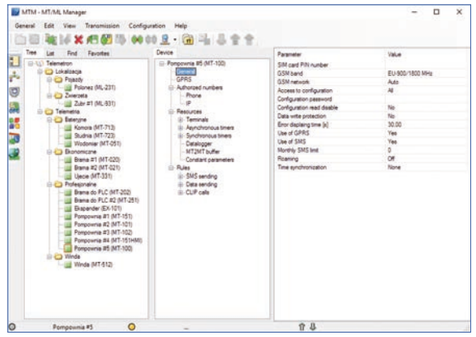
Outputs Q1 – Q8

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

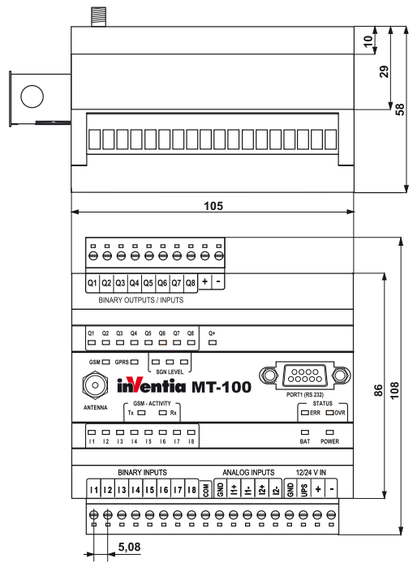
Analog inputs AN1, AN2 (4–20 mA)

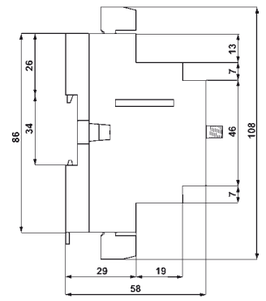
Measurement range	4 – 20 mA
Maximum input current	50 mA max.
Input dynamic impedance	25 Ω typ.
Voltage drop at 20mA	< 5 V max.
A/D converter resolution	10 bit
Accuracy	± 1,5 % max.
Nonlinearity	± 1 % max.

Configuration environment



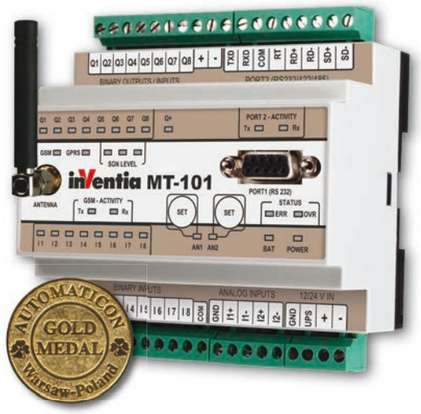
Drawings and dimensions (all dimentions in millimeters)





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

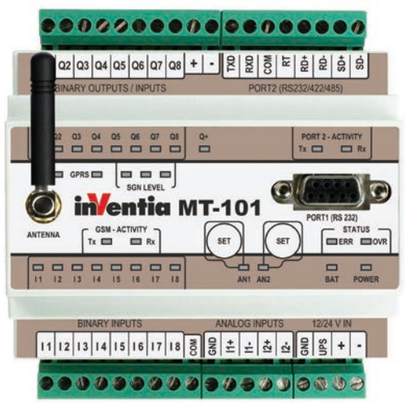


Telemetry Module MT-101 is a professional device combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network.

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 0,10	Active 0,60	Max 1,90
Input current (A) (for 24V DC)	Idle 0,06	Active 0,25	Max 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

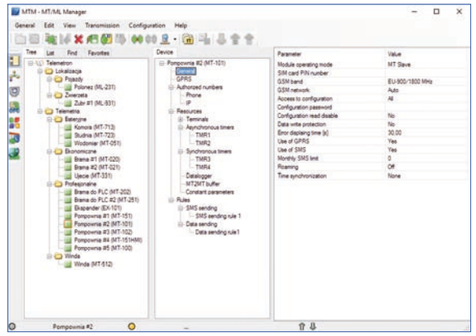
Outputs Q1 – Q8

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

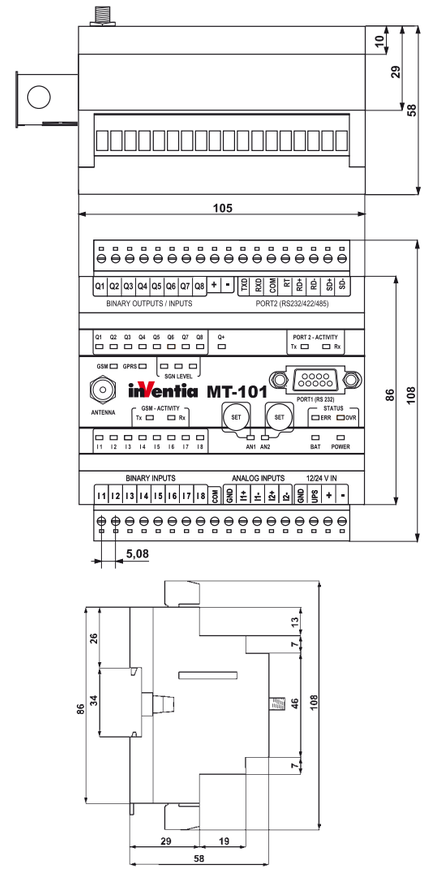
Analog inputs AN1, AN2 (4 – 20 mA)

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

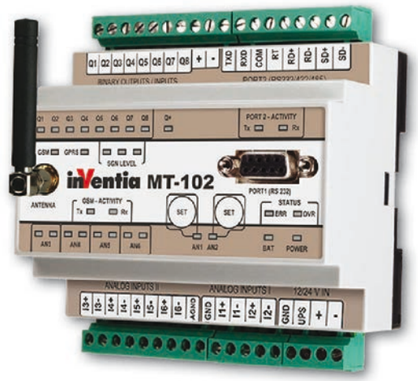


Drawings and dimensions (all dimentions in millimeters)



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

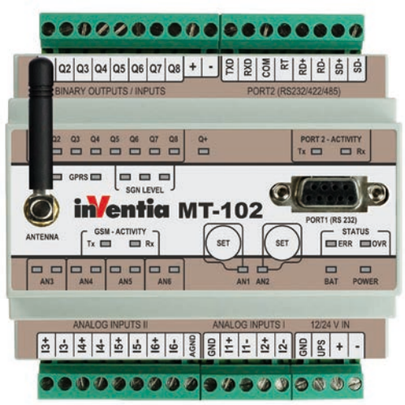


Telemetry Module MT-102 is a professional device combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for GPRS packet transmission over GSM network.

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 0,10	Active 0,60	Max 1,90
Input current (A) (for 24V DC)	Idle 0,06	Active 0,25	Max 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

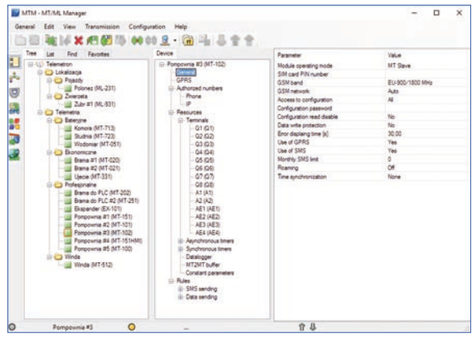
Analog inputs AN1, AN2 (4 – 20 mA)

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

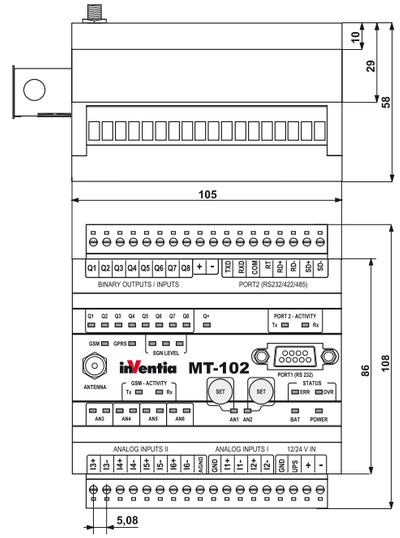
Analog inputs AN3 – AN6 (4 – 20 mA)

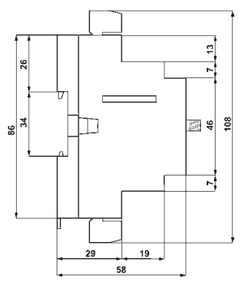
Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	50 Ω typ.
Voltage drop at 20mA	5,5 V max.
A/D converter	U/f
Accuracy	±0,5 % max.
Nonlinearity	±0,2 % max.
Maximum operating voltage	36 V

Configuration environment



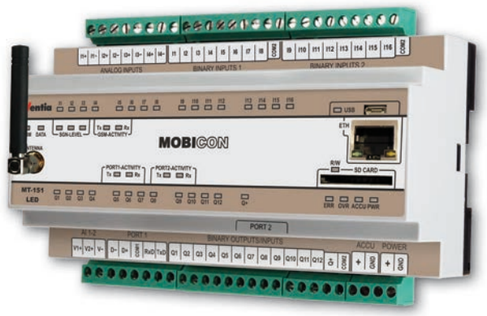
Drawings and dimensions (all dimentions in millimeters)





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

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



Seria MT-151 LED v2 is a family of new generation telemetry controller for demanding tasks and applications. MT-151 LED v2 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** annunciate 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 v2 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 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
- micro USB (AB) 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/UMTS network, active GPRS session, signal level, RX and TX activity of GSM modem, RX and TX activity of communication ports, operations on SD card, module status, primary and backup power source)
- Internal flags and registers for user application program
- Possibility to flash firmware remotely
- Data and Event logger supporting SD card
- RTC with external synchronization functions

Functionality

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

General

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

GSM/GPRS Modem

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

Inputs I1 – I16 *

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

Inputs Q1 – Q12 *

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

Outputs Q1 – Q12

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

Analog inputs 0 – 10 V (2)

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

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

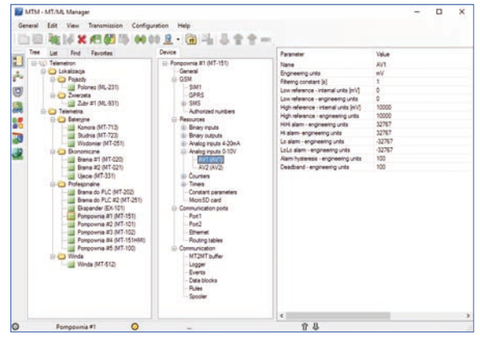
Analog inputs 4 – 20 mA (4)

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

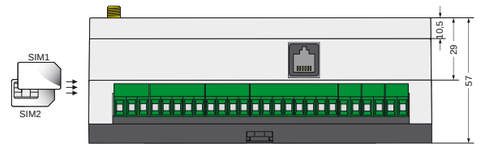
Power supply

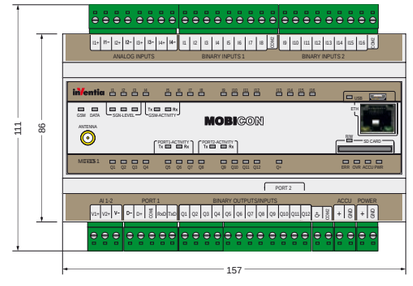
DC (nom. 12/24 V)	10,8 – 30 V		
Input current (@ 24 VDC)	Idle 0,06 A	Active 0,25 A	Max. 1,00 A

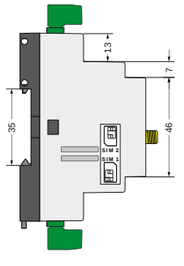
Configuration environment



Drawings and dimensions (all dimentions in millimeters)



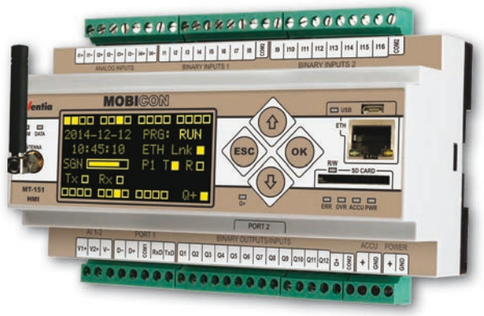




MT-151 LED v2

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

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



MT-151 HMI v2 is a family of new generation telemetry controllers for demanding tasks and applications. MT-151 HMI v2 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 v2 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 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
- micro USB (AB) 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 SD card
- RTC with external synchronization functions

Functionality

- Transmission models:
  - 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 lo/HSPTAgic 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 SD card with 0,1 sec res.
- Transmission of data from external devices connected to RS-232/485 serial port

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

General

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

GSM/GPRS Modem

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

Inputs I1 – I16 *

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

Inputs Q1 – Q12 *

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

Outputs Q1 – Q12

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

Analog inputs 0 – 10 V (2)

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

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

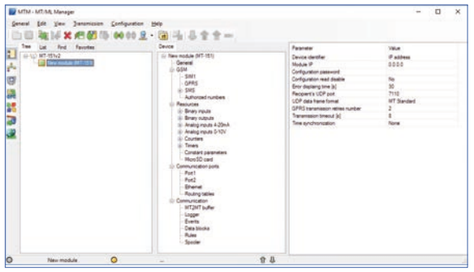
Analog inputs 4 – 20 mA (4)

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

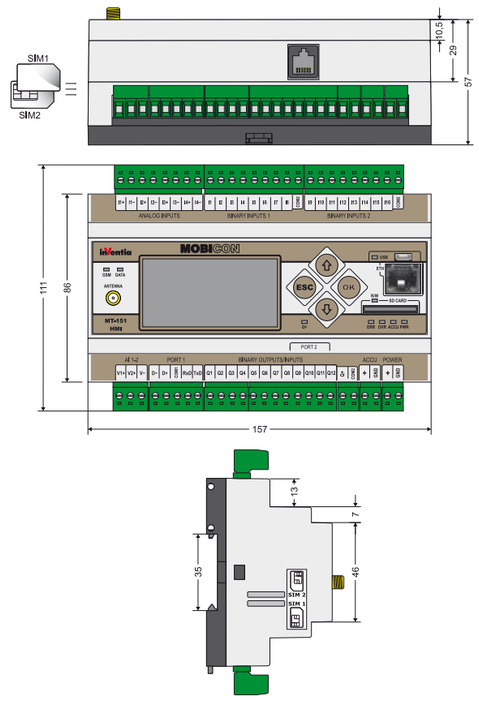
Power supply

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

Configuration environment

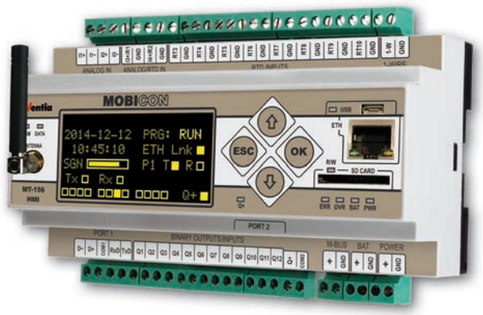


Drawings and dimensions (all dimentions in millimeters)



MT-156 HMI – Mobile Controller for 2G/3G telemetry

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



MOBICON is a family of new generation telemetry controllers for demanding tasks and applications. MT-156 HMI model is a professional, industrial design combining functionality of programmable logic controller, data logger, protocol converter and wireless communication interface for 2G/3G 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 eatures and easy to use configuration tools the MT-156 HMI controller is an optimal solution for demanding wireless telemetry, control, diagnostic, surveillance and alarm systems.

Resources

- 12 optoisolated binary outputs 12/24 VDC (Q1 – Q12) - selectively configurable as inputs
- 2 optoisolated analog inputs 4-20 mA with configurable hysteresis and filtration
- 2 analog inputs 4-20 mA configurable as RTD inputs for 2 wire PT1000 temperature sensor
- 8 RTD inputs for 2-wire PT1000 temperature sensor
- Ethernet port 10Base-T/100Base-TX
- Isolated RS-232/485 serial port
- RS-232 serial port for external LoRa gateway
- 1-wire communication interface
- USB port for local configuration and programming
- Interface for backup 12V SLA battery – charging support
- 2 SIM holders – Dual-SIM support
- Embedded temperature sensor
- OLED graphic display (128x64) and status LEDs
- Internal flags and registers for user application program
- Firmware Flash memory with remote update capability
- Data logger supporting SD card
- RTC with external synchronization functions

Functionality

- Transmission modes:
  - GPRS/EDGE/3D - packet transmission
  - SMS
- Access to the module recources using standard protocols MODBUS RTU and MODBUS TCP
- Intelligent packet routing and Multimaster support in Modbus mode
- Data packets broadcast in transparent mode
- Programmable control logic using I/Os, timers, counters, flags and registers for triggering events (data transmission/recording, SMS transmission, control outputs)
- Event based transmission (unsolicited messaging) triggered by change 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 recording on SD card with 1 sec resolution
- Transmission of data from external devices connected to RS-232/485 serial port and Ethernet port
- Configurable events based on mirrored resources of external devices
- Remote configuration and programming via GPRS\EDGE\3G and Ethernet port
- Configurable access security – list of authorized IPs and tel. numbers, optional password
- DIN rail mounting
- Supply voltage 12/24 VDC (24 VDC required for battery buffered power supply operation)
- Built-in management of external SLA backup battery
- Built-in advanced auto-diagnostics
- Detachable terminal blocks
- Auto configuration based on individual ID number read through 1-Wire interface

General

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

GSM/GPRS Modem

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

Inputs Q1 – Q12

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

Outputs Q1 – Q12

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

Power Supply

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

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

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

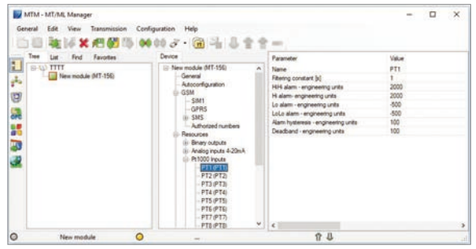
Analog inputs 4 – 20 mA (2)

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

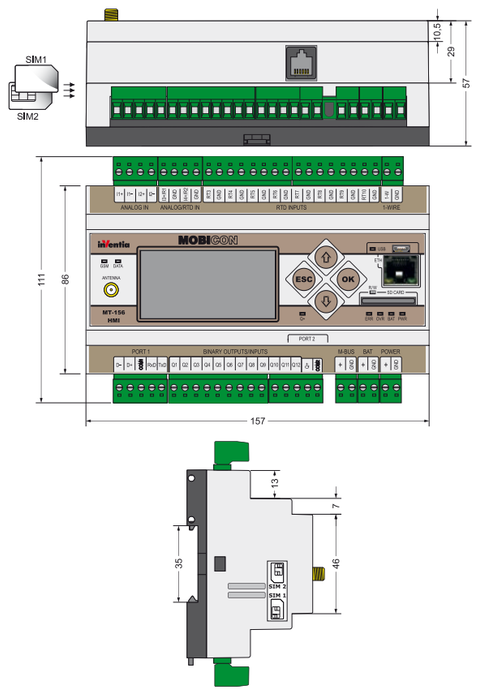
Analog inputs PT1000 (10)

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

Configuration environment



Drawings and dimensions (all dimentions in millimeters)



MT-156 HMI

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 (usolicited 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.

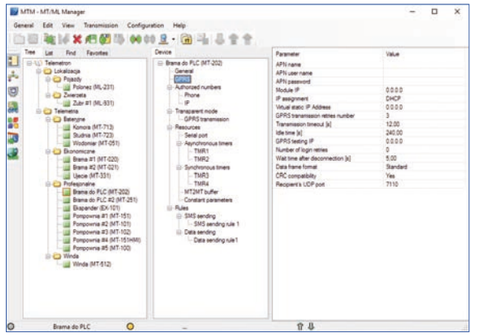
Power supply

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

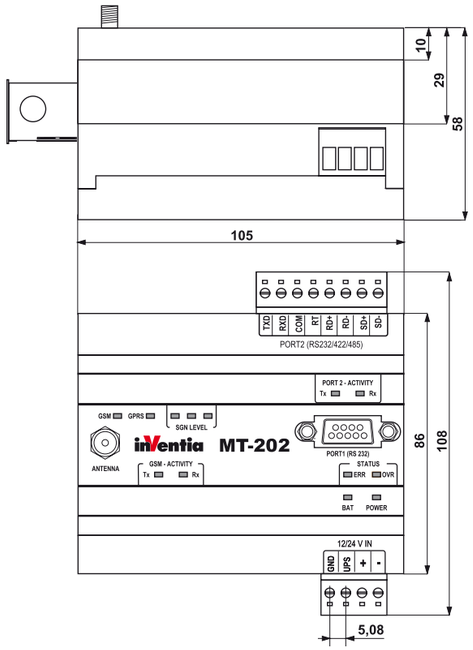
GSM/GPRS Modem

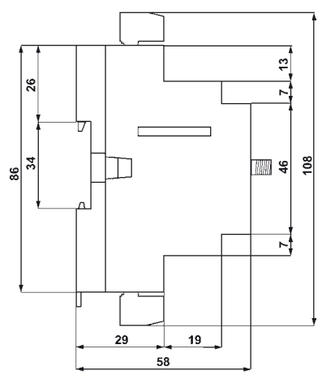
Modem type	CINTERION TC63i
GSM	QuadBand (850/900/1800/1900)
Frequency range:	
GSM 850	Transmitter: 824 – 849 MHz Receiver: 869 – 894 MHz
EGSM 900	Transmitter: 880 – 915 MHz Receiver: 925 – 960 MHz
DCS 1800	Transmitter: 1710 – 1785 MHz Receiver: 1805 – 1880 MHz
PCS 1900	Transmitter: 1850 – 1910 MHz Receiver: 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 dimentions in millimeters)





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

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 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 recourses. In such case MT-251 creates in memory a mirror of the external recourses 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

Functionality

- Transmission mode: 2G/3G packet transmission, SMS, Ethernet
- Access to remote recourses 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
- 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
Protecion 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 EGSM 900 DCS1800 PCS 1900	 Transmitter: 824 MHz - 849 MHz Receiver: 869 MHz - 894 MHz Transmitter: 880 MHz - 915 MHz Receiver: 925 MHz - 960 MHz Transmitter: 1710 MHz - 1785 MHz Receiver: 1805 MHz - 1880 MHz 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

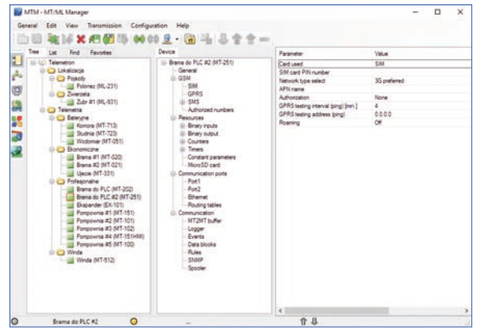
Operating in binary input mode:

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.

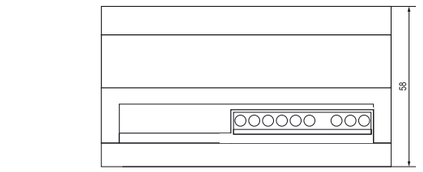
Binary output Q1:

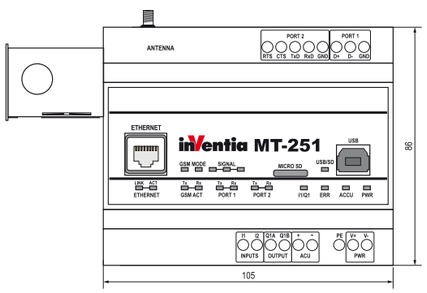
Recommended mean current for output	100 mA
Maximum current for output	1A max.
Output resistance in ON state	500 mΩ max.

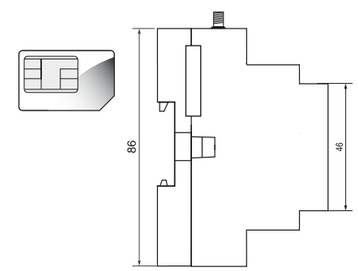
Configuration environment



Drawings and dimensions (all dimentions in millimeters)







MT-251

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*

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

Resources

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

Functionality

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

** option*

5DI/2DO

2AI

RS-485 option

ML-231

General

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

GSM/GPRS Modem

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

GPS Receiver

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

Power supply

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

Inputs I1 – I5

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

Output 1, 2

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

Input 1-Wire 1, 2

Standard	Dallas I-Button
Application	driver authorization temperature measurement

Analogue Inputs

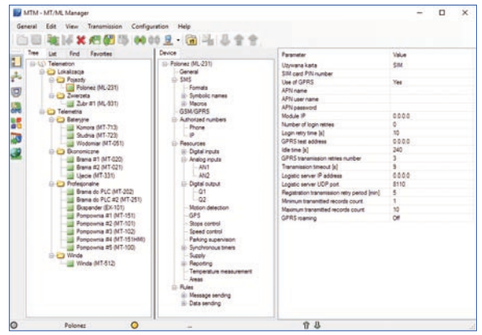
Measurment range	0 – 10 V*
Input Resistance	200 kΩ
A / D converter	12 bits

* with the possibility to increase the scope

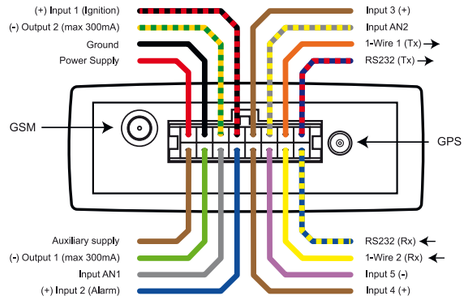
Serial ports

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

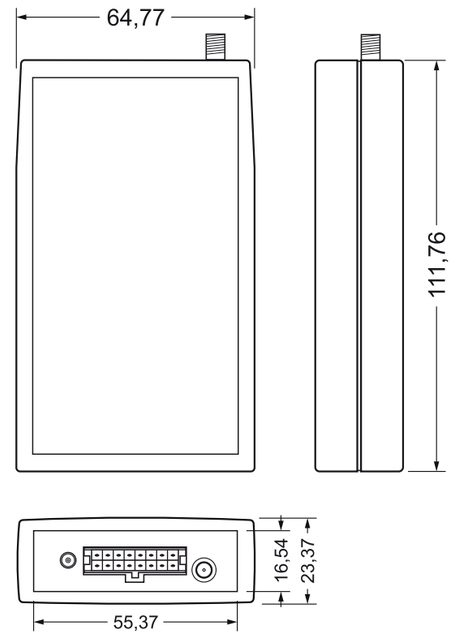
Configuration environment



Connections



Drawings and dimensions (all dimentions in millimeters)



ML-231

ML-941 – Energy saving location module GPS/GPRS ☞ NEWEST!

- **Specialized module for location and monitoring of wild and free going animals**
- **Integral, 50 channels GPS receiver with highest sensitivity (-162 dBm) SuperSense® technology**
- **Integral, quad-band GSM modem**
- **1 binary/supply* output**
- **Large 30k records data logger**
- **Serial port (1,8 V)**
- **3 axis accelerometer**

Energy saving location module ML-941 is a specialized telemetry module dedicated to monitor wild animals and other mobile objects.

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

The module is manufactured as OEM without dedicated housing.

Resources

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

Functionality

- Cyclical location computing based on received GPS signals
- Detection of missing GPS signal
- Reporting according to defined criteria of time, motion, activity
- Logging of information when GSM communication is not available
- Transmission modes
  - GPRS – packet transmission
  - SMS
- Transmitting information according to time schedule
- Configurable home and roaming transmission parameters
- Dynamic SMS compilation allowing sending current measurement data
- Adjustable SMS transmission limit
- Remote configuration via GPRS/SMS - the module is preconfigured by manufacturer
- Configurable access security list for IP addresses and phone numbers
- Monitoring of power supply voltage
- Monitoring of internal parameters state
- 3-axis accelerometer
  - motion detection
  - activity detection
- Optional silicone rubber molding to achieve IP65 ingress protection
- Reed-switch activated storage mode
- LED module's status indicator
- Serial port for communication with extension modules

General

Dimensions (length x width x height)	62,5 x 33 x 11 mm
Weight	25 g
Mounting method (proprietary)	user defined
Operating temperature	-40 to +50 °C
Protection class	none (IP65 optional)

GSM/GPRS Modem

Modem type	SAKA G350
GSM	GSM Quad Band (850/900/1800/1900)
GPRS class	10
Antenna	built in antenna

GPS receiver

Receiver type	μblox SAM-M8Q
Sensitivity (GPS tracking)	-164 dBm
Channel number	72
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 (1,8 V)
Application	external sensors

Configuration environment

Drawings and dimensions (all dimentions in millimeters)

MT-512 – Specialized Alarm Module for lifts

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

8DI/2DO

DIN RAIL

RS-232 option

RS-485 option

MT-512

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

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

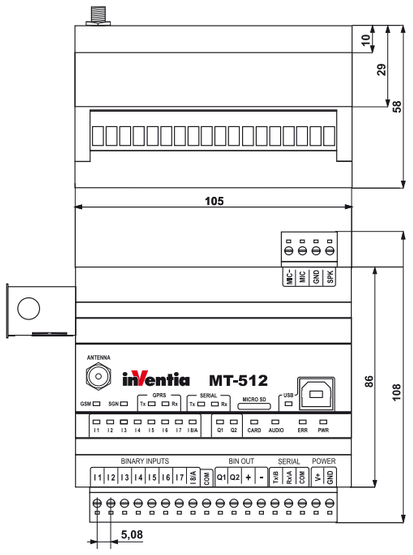
Inputs I1 – ALARM/I8

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

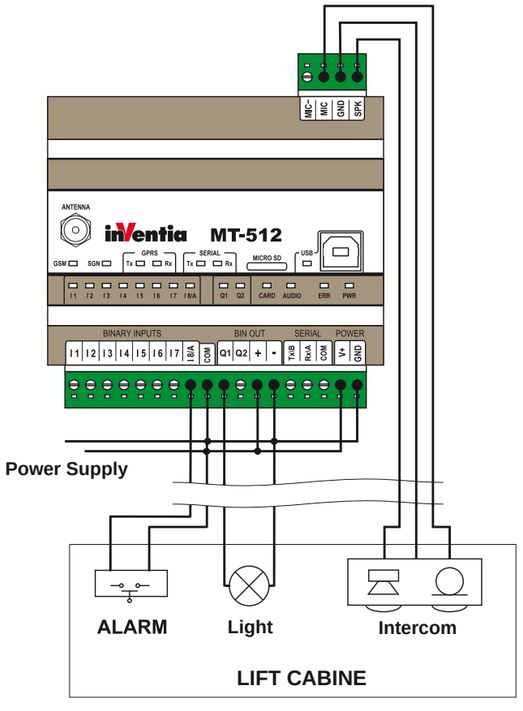
Outputs Q1,Q2

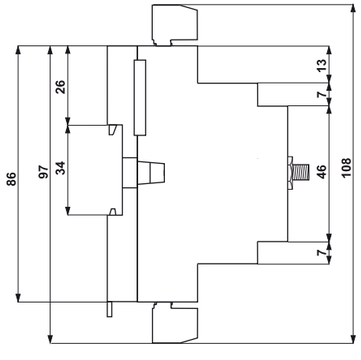
Input voltage range	0 – 30 V
Recommended mean current for single output	50 mA
Single output current	350 mA max.
Average current for all outputs	400 mA max.
Voltage drop for 350 mA	<3,5 V max.
Current in off state	< 0,2 mA max.

Drawings and dimensions (all dimentions in millimeters)



Application example





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; 5,8 Ah capacity
Input current (for 24V): Idle Active Max	 800 μA 70 mA, 200 mA (charging) 0,7 A

Inputs IN1, IN2

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

Outputs OUT1, OUT2

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

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

0-100 mV input: mVA, mVB	
Measurement range	±100 mV
Measurement resolution	1 uV
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

GPS receiver

Time synchronization accuracy	±1 ms

Communication interfaces RS-485, USB, BLE

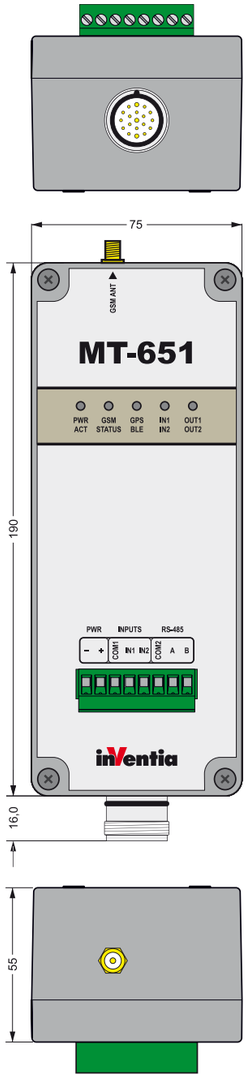
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* 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 dimentions in millimeters)



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 Active Max	 800 μA 70 mA, 200 mA (charging) 0,7 A

Inputs IN1, IN2

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

Outputs OUT1, OUT2

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

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

0-100 mV input: mVA, mVB	
Measurement range	±100 mV
Measurement resolution	1 uV
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

GPS receiver

Time synchronization accuracy	±1 ms

Communication interfaces RS-485, USB, BLE

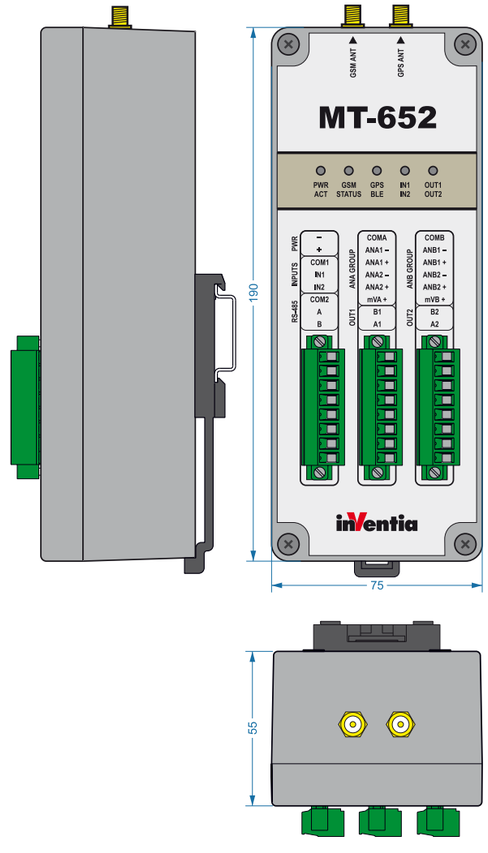
Wired	RS-485 (optoisolated) USB (Non Isolated, internal)
Wireless (remote)	Bluetooth 4.x, BLE*

* 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

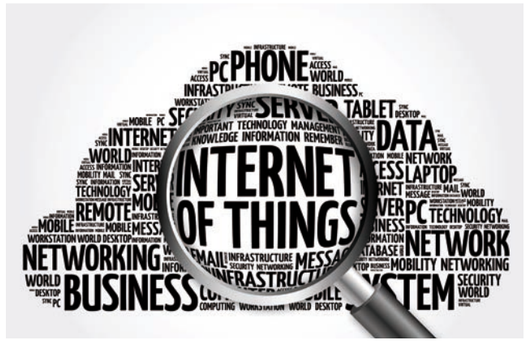
Drawings and dimensions (all dimentions in millimeters)



Family of IoT devices provide affordable and easy to implement method to enhance your system with distributed measurement network solution. It consists of various sensors and gateways supporting industry standard protocols for communication with higher tier systems.

Communication between sensors and gateway is based on LoRa radio technology. It is using free frequency range 869.4 – 869.65 MHz – it does not require license to use it. Practical range of communication is up to 300m with low demand of power.

Sensor visibility and strength of each sensor signal can be tested by IOT-TST-01 – radio communication tester. This device provides on its screen information about signal strength of all visible compatible IoT sensors thus allowing to position sensors and gateways in places providing best signal propagation.



LoRa

IoT Sensors

IOT-RT-01

Battery powered internal temperature sensor. Up to 5 years of operation on one battery.

Can be used to wirelessly monitor air temperature in remote rooms and chambers like server rooms, storage rooms, district city heat chambers, machine rooms and other.

Sensors are equipped with QR tags. It is possible to equip them with RFID tags as well.

Temperature measurement	
Range	-20.0 °C – 60.0 °C
Accuracy	±1 °C
Measurement sending period	15 min
LoRa radio	
Communication frequency	869.40 – 869.65 MHz (other bands on demand)
Power	25 mW
Antenna	Internal
Power supply	
Power supply voltage	3.6 VDC (AA lithium battery)
Max current	50 mA
Min current	15 μA
General	
Ingres protection	IP30
Operating temperature range	-20.0 °C – 60.0 °C
Dimensions (WxHxD)	71 mm x 71 mm x 27 mm
Weight	65 g
Mounting	Velcro tape

IOT-RTH-01

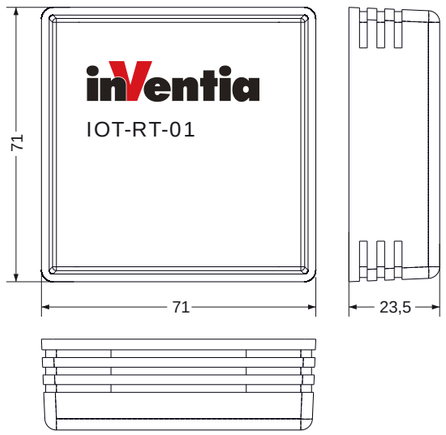
Battery powered internal temperature and humidity sensor. Up to 5 years of operation on one battery.

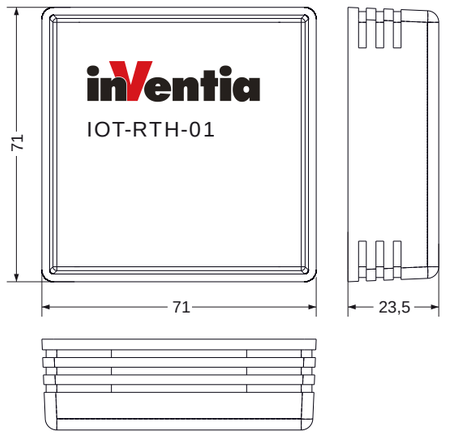
Can be used to wirelessly monitor air temperature and humidity in remote rooms and chambers like server rooms, storage rooms, district city heat chambers, machine rooms and other.

Sensors are equipped with QR tags. It is possible to equip them with RFID tags as well.

Temperature measurement	
Range	-20.0 °C – 60.0 °C
Accuracy	±1 °C
Measurement sending period	15 min
Humidity measurement	
Range	0.0 – 100.0 %
Accuracy	±1 %
Measurement sending period	15 min
LoRa radio	
Communication frequency	869.40 – 869.65 MHz (other bands on demand)
Power	25 mW
Antenna	Internal
Power supply	
Power supply voltage	3.6 VDC (AA lithium battery)
Max current	50 mA
Min current	15 μA
General	
Ingres protection	IP30
Operating temperature range	-20.0 °C – 60.0 °C
Dimensions (WxHxD)	71 mm x 71 mm x 27 mm
Weight	65 g
Mounting	Velcro tape

Drawings and dimensions (in millimeters)





WARRANTY 3 YEARS

DIN RAIL

RS-232

RS-485

IoT Devices Family

IoT gateways

IOT-RG-01

RS-232 Modbus RTU gateway allowing to read out remote sensors. Can be used with any device with Modbus RTU Master functionality and RS-232 port like PLCs, GPRS telemetry modules, routers, HMI panels, PCs.

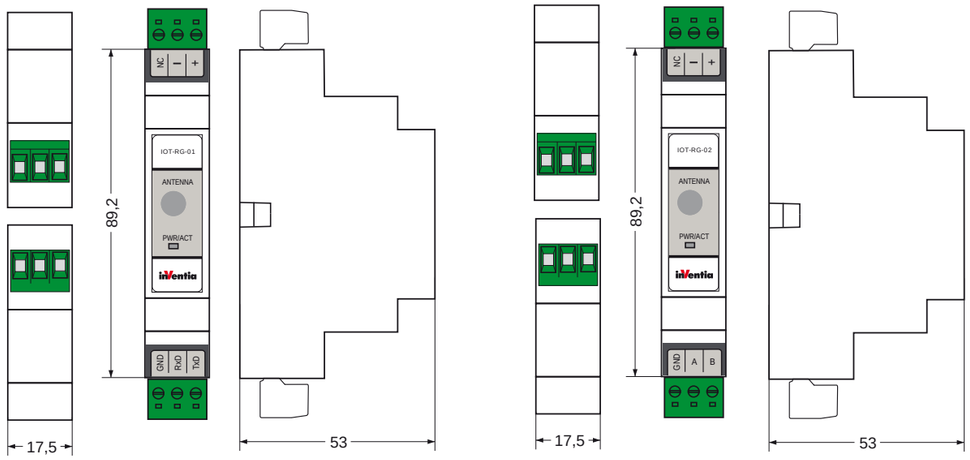
RS-232	
Default port settings	115200 8-N-1
Protocol	Modbus RTU
LoRa radio	
Communication frequency	869.40 – 869.65 MHz (other bands on demand)
Power	25 mW
Antenna	Internal
Power supply	
Power supply voltage	5 – 30 VDC
Maximum current	22 mA
Mean current	11 mA
General	
Ingres protection	IP30
Operating temperature range	-20.0 °C – 60.0 °C
Dimensions (WxHxD)	18 mm x 90 mm x 58 mm
Weight	60 g including antenna
Mounting	35mm DIN rail

IOT-RG-02

RS-485 Modbus RTU gateway allowing to read out remote sensors. Can be used with any device with Modbus RTU Master functionality and RS-485 port like PLCs, GPRS telemetry modules, routers, HMI panels, PCs.

RS-485	
Default port settings	9600 8-N-1
Protocol	Modbus RTU
LoRa radio	
Communication frequency	869.40 – 869.65 MHz (other bands on demand)
Power	25 mW
Antenna	Internal
Power supply	
Power supply voltage	5 – 30 VDC
Maximum current	22 mA
Mean current	11 mA
General	
Ingres protection	IP30
Operating temperature range	-20.0 °C – 60.0 °C
Dimensions (WxHxD)	18 mm x 90 mm x 58 mm
Weight	60 g including antenna
Mounting	35mm DIN rail

Drawings and dimensions (in millimeters)



Tester IoT

Tester IoT

Radio communication tester providing on its screen information about signal strength of all visible compatible IoT sensors. It faciliates instalation of other IoT devices in places providing best signal propagation.

Display	
Size	1.6”
Resolution	102 x 64 pxl
LoRa radio	
Communication frequency	869.40 – 869.65 MHz (other bands on demand)
Power	25 mW
Antenna	Internal
Power supply	
Power supply	internal Li-Ion battery
Charging	5 V miniUSB port
Max. operating time without charging	18 h
General	
Ingres protection	IP30
Operating temperature range	-20.0 °C – 60.0 °C
Dimensions (WxHxD)	65 mm x 130 mm x 25 mm
Weight	155 g
Mounting	handheld device

EX-101 – Modbus RTU Slave I/O Module

WARRANTY 3 YEARS

PLC

8-16DI /0-8DO

2AI

DIN RAIL

RS-232

RS-232/422/485

- 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)
- Modubus RTU communication protocols
- Removable terminal blocks
- Easy configuration software

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

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

Functionality

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

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.

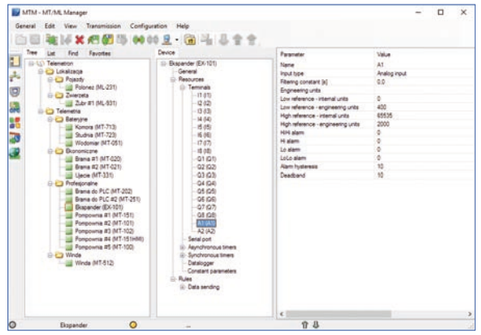
Outputs Q1 – Q8

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.

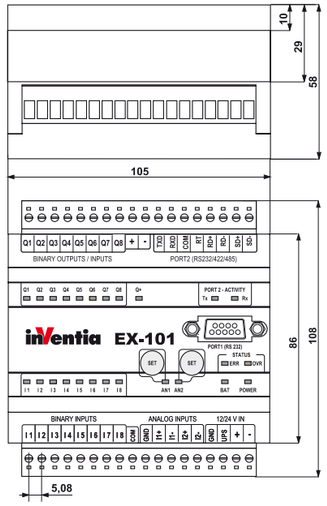
Analog inputs A1, A2 (4 – 20 mA)

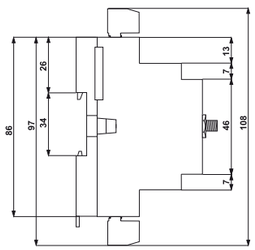
Input current	4 – 20 mA
Maximum input current	50 mA max.
Dynamic input impedance	25 Ω typ.
Voltage drop at 20mA	<5 V max.
A/D converter	10 bit
Accuracy	±1,5 % max.
Nonlinearity	± 1 % max.

Configuration environment

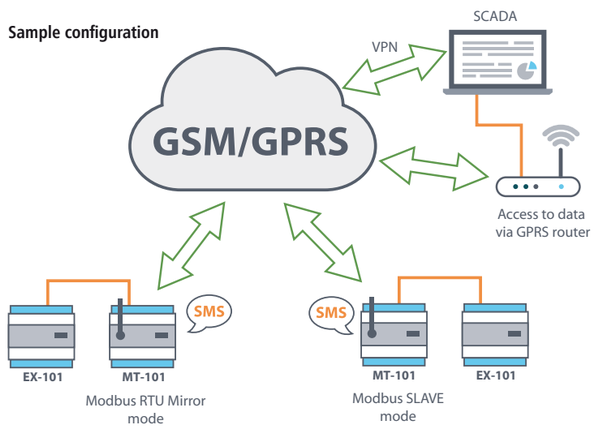


Drawings and dimensions (all dimentions in millimeters)





Sample configuration



EX-101

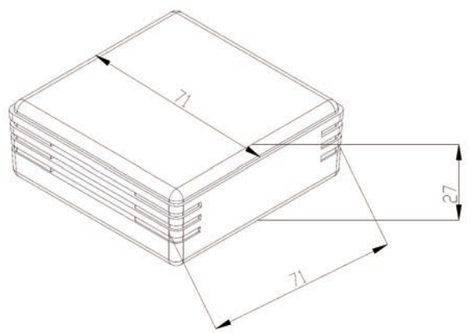
EX-101

THF-01 – temperature, humidity and atmospheric pressure wall sensor

- 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 dimentions in millimeters)



General

Supply voltage: From an external source From the internal lithium battery	 10 – 30 VDC 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 x71 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 from -10 °C to +85 °C from -14 °C to +85 °C	 ± 0,5 °C ± 1 °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

RM-120 – M-BUS converter module

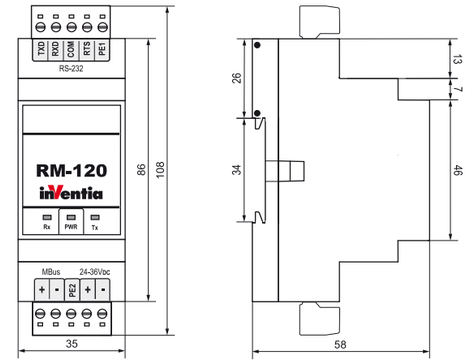
- Supports up to 120 M-Bus devices per single bus
- Power on the RS-232 communication port is not required
- Galvanic isolation of RS-232 and M-Bus communication ports
- Supports rates of 1200, 2400, 4800, 9600 bps
- Built-in M-Bus short-circuit and over-voltage protection
- 3 diagnostic LEDs
- Detachable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

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

Drawings and dimensions (all dimentions 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 1 M-Bus -> RS-232 transmission 0 1	 Vz Vz-12V 0 – 1,5 mA 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

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 algorythm for auto-adjustment for photovoltaic cell uses the energy delivered by photo voltaic cell under poor light conditions.

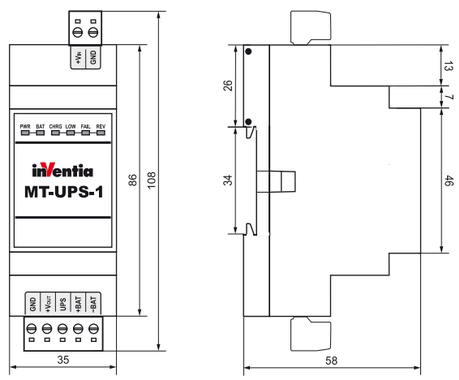
Functionality

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

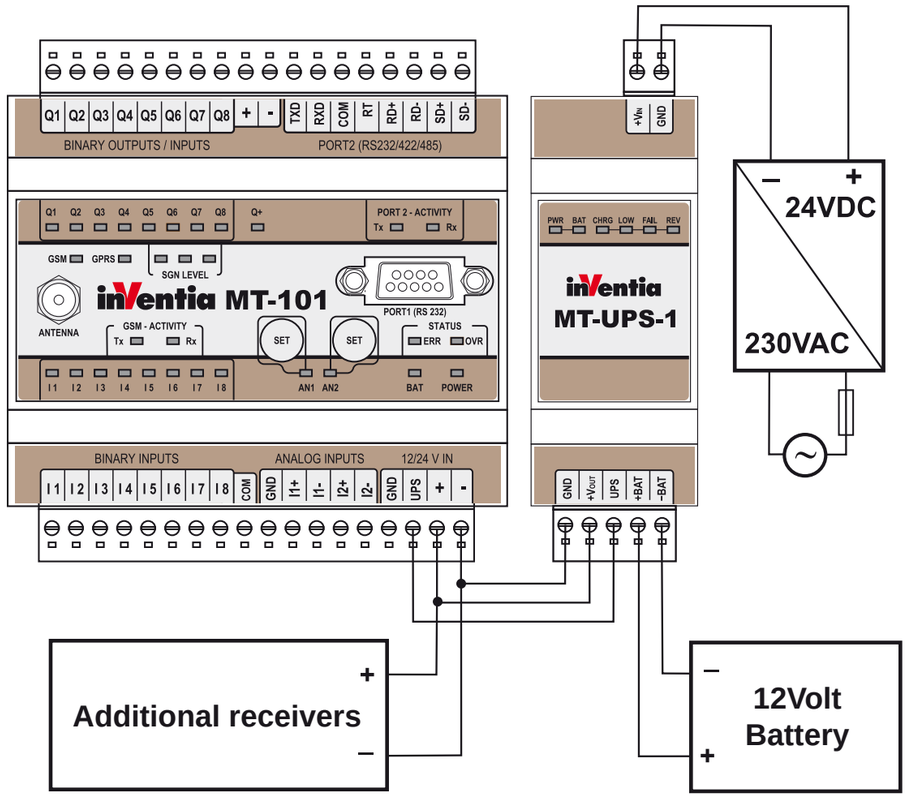
Technical data:

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

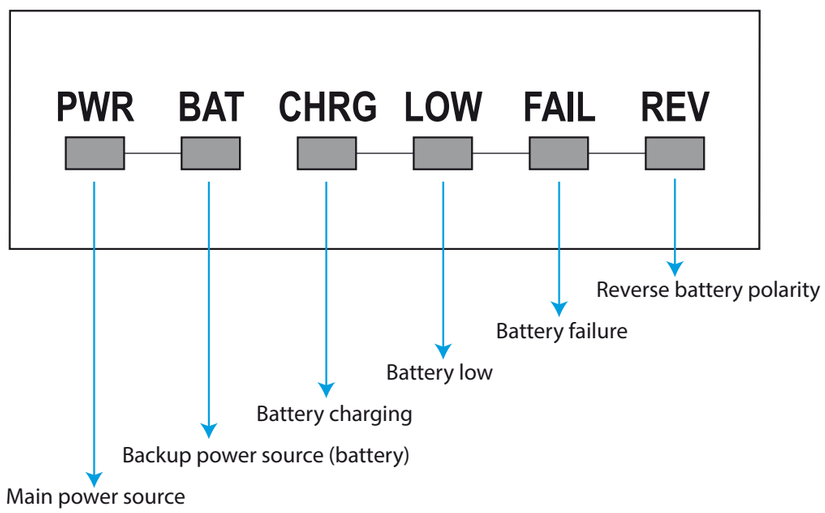
Drawings and dimensions (all dimentions in millimeters)



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



MT-UPS-1 Status LED diodes



Sensor
for loading and unloading

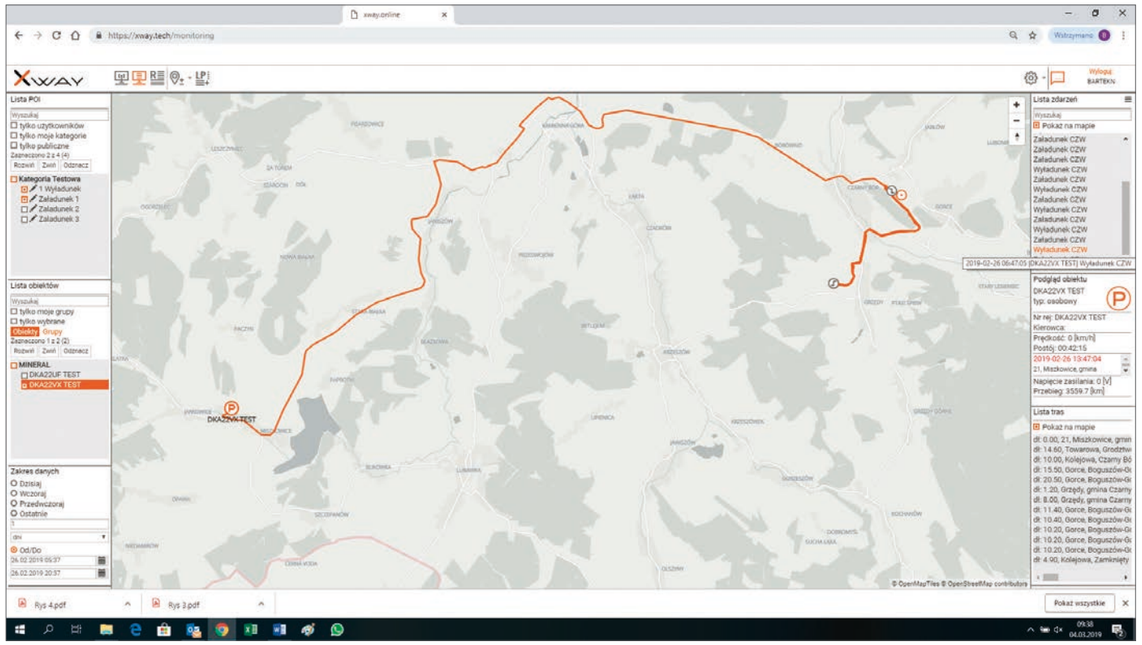
For one of our clients – a general contractor for road infrastructure – we have adapted the Xway system to the task of monitoring the spreading of substrates on road construction sites.

The modification of the system includes the implementation of an automatic sensor of trailer loading and unloading and the adaptation of the xway.online application for cooperation with this sensor along with a series of changes to facilitate the use of the system for this group of customers, including the introduction to the chainage system.

This solution allows you to fully automate the process of building road surfaces. It consists of two parts:

- cabin part, powered from the cigarette lighter socket, which is a GPS/GSM module,
- the external part, which is the actual sensor that generates automatically the signals of loading and unloading.

Both parts communicate by radio using BlueTooth 4.0 technology.



Visualization of incoming loading and unloading signals on the map from the xway.online application

The loading and unloading sensor itself was built using an electronic gyroscope and extremely energy-saving electronics, which allows it to work for more than 3 years on a single set of batteries.

Data from the sensor go to the xway.online server, where the user has access to incoming data and to analytical tools allowing monitoring and settlement of goods moving on the construction site.

Trailing and unloading sensor mounted on the trailer

Sensor for loading and unloading

The solution we propose also allows you to work without a loading/unloading sensor. In this case, the loading and unloading moments can be marked by pressing the buttons on the cabin terminal or you can define the loading and unloading places (POIs for loading and unloading, respectively) and generate a report of entries into such defined zones.

DKA22VX TEST | DKA22VX TEST

	Załaduek - czas	Wyładunek - czas	Miejsce załadunku	Miejsce wyładunku	Czas zał. / wył.	Dystans [km] zał. / wył.
1	06:48:16 2019-03-01	07:04:10 2019-03-01	Załadunek 1	Wyładunek	0:15:54	5.3
2	07:21:53 2019-03-01	07:48:50 2019-03-01	Załadunek 1	Wyładunek	0:26:57	5.3
3	08:04:17 2019-03-01	08:25:02 2019-03-01	Załadunek 1	Wyładunek	0:20:45	5.3
4	08:40:26 2019-03-01	08:59:26 2019-03-01	Załadunek 1	Wyładunek	0:19:00	5.1
5	09:11:49 2019-03-01	09:35:57 2019-03-01	Załadunek 1	Wyładunek	0:24:08	5.1
6	09:47:15 2019-03-01	10:08:28 2019-03-01	Załadunek 1	Wyładunek	0:21:13	5
7	10:20:10 2019-03-01	10:49:21 2019-03-01	Załadunek 1	Wyładunek	0:29:11	5
8	11:00:00 2019-03-01	11:19:23 2019-03-01	Załadunek 1	Wyładunek	0:19:23	5.3
9	12:24:36 2019-03-01	12:45:43 2019-03-01	Załadunek 1	Wyładunek	0:21:07	5.3
10	12:57:18 2019-03-01	13:18:08 2019-03-01	Załadunek 1	Wyładunek	0:20:50	5.3
11	13:30:04 2019-03-01	13:49:04 2019-03-01	Załadunek 1	Wyładunek	0:19:00	5.2
12	14:01:29 2019-03-01	14:20:10 2019-03-01	Załadunek 1	Wyładunek	0:18:41	5.3
13	14:33:05 2019-03-01	14:55:22 2019-03-01	Załadunek 1	Wyładunek	0:22:17	5.2
14	15:08:53 2019-03-01	15:29:27 2019-03-01	Załadunek 1	Wyładunek	0:20:34	5.2
15	15:41:51 2019-03-01	15:58:45 2019-03-01	Załadunek 1	Wyładunek	0:16:54	5.3
16	16:11:00 2019-03-01	16:28:15 2019-03-01	Załadunek 1	Wyładunek	0:17:15	5.3
17	16:41:40 2019-03-01	16:57:59 2019-03-01	Załadunek 1	Wyładunek	0:16:19	5.3
18	17:08:48 2019-03-01	17:25:25 2019-03-01	Załadunek 1	Wyładunek	0:16:37	5.2

Liczba załadunków	Liczba wyładunków	Średni czas pomiędzy załadunkiem a wyładunkiem	Średnia droga pomiędzy załadunkiem a wyładunkiem	Dystans z ładunkiem	Dystans bez ładunku	Dystans całkowity
		0:20:20	5.2	94	88.4	182.4

wany przez system xway.online

Sample report using entries to defined places of loading and unloading

DKA50MN TEST | DKA50MN TEST

	Załaduek - czas	Wyładunek - czas	Miejsce załadunku	Miejsce wyładunku	Czas zał. / wył.	Dystans [km] zał. / wył.
1	---	08:58:40 2019-02-25	---	Kolejowa, Czarny Bór, RP	---	---
2	09:13:12 2019-02-25	09:26:50 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:13:38	5.1
3	09:43:04 2019-02-25	09:56:58 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:13:54	5.2
4	10:09:36 2019-02-25	10:24:04 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:14:28	5.1
5	11:07:39 2019-02-25	11:21:17 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:13:38	5.1
6	12:19:11 2019-02-25	12:32:08 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:12:57	5.2
7	12:46:43 2019-02-25	13:00:23 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:13:40	5.1
8	13:13:25 2019-02-25	14:23:03 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	1:09:38	25.6
9	14:33:07 2019-02-25	14:47:47 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:14:40	5.2
10	15:14:50 2019-02-25	15:30:05 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:15:15	5.2
11	16:10:44 2019-02-25	16:25:04 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:14:20	5.1
12	16:37:00 2019-02-25	16:51:46 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:14:46	5.1
13	17:05:03 2019-02-25	17:19:07 2019-02-25	Boguszów-Gorce, RP	Kolejowa, Czarny Bór, RP	0:14:04	5.1

Liczba załadunków	Liczba wyładunków	Średni czas pomiędzy załadunkiem a wyładunkiem	Średnia droga pomiędzy załadunkiem a wyładunkiem	Dystans z ładunkiem	Dystans bez ładunku	Dystans całkowity
12	13	0:18:45	6.8	82.1	82.1	164.2

2019-02-25 17:54:02 Raport wygenerowany przez system xway.online

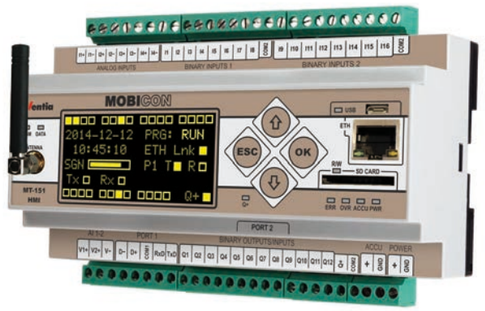
Sample report using automatic loading and unloading signals

In the development of the Xway.online project, we benefited from EU funding under the Measure OP IR 2.3.2 Innovation for SME program, project number POIR.02.03.02-14-0014 / 1-01, *„Development and implementation of the GreenWay internet platform together with reading tachographs and driver cards and a notification module."*

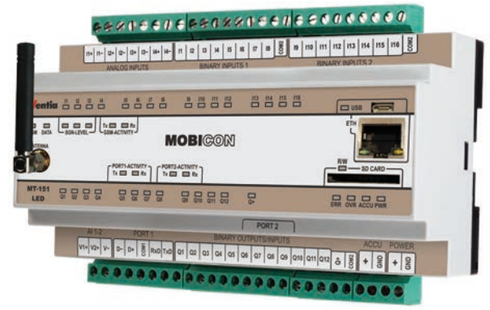
Fundusze Europejskie Inteligentny Rozwój

Unia Europejska Europejski Fundusz Rozwoju Regionalnego

Support for **GENIbus** protocol in MT-151



MT-151 HMI V2

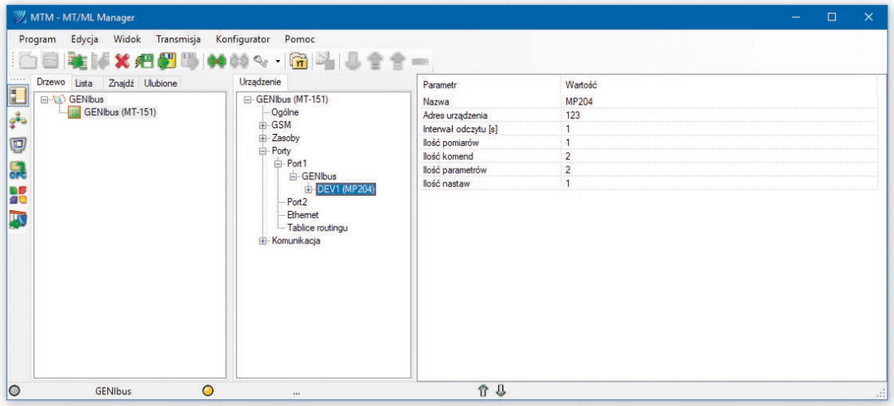


MT-151 LED V2

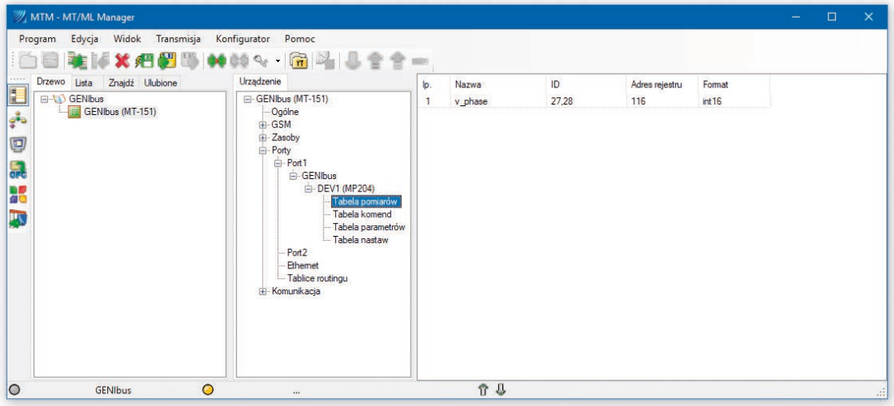
The latest firmware for MT-151 has added support for the GENIbus protocol used in devices manufactured by the Danish company Grundfos. The module allows you to connect up to four devices to the PORT1 port. The implementation supports the following classes: 2 (Measurements), 3 (Commands), 4 (Parameters) and 5 (Settings), as well as commands GET for read and SET for write, respectively. This set allows for free monitoring and control of pumps, motor protections, flow meters and other devices supporting the GENIbus protocol. What is more, data and controls can be accessed remotely via a mobile network (packet data transmission in 2G and 3G networks) using the free MTDataProvider driver or Modbus TCP protocol, as well as locally by using Modbus RTU protocols (device serial ports) and Modbus TCP (Ethernet port).

In order to communicate with the use of the GENIbus protocol, you must connect the device that supports the GENIbus protocol (e.g. motor protection MP204) to the terminals D-, D+ in the serial port PORT1.

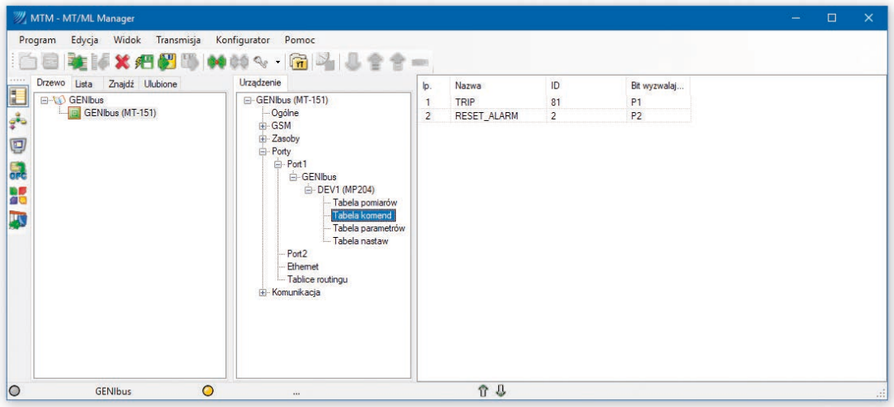
In the next step, we enable the support for the serial port PORT1 in the GENIbus mode in the MTManager configuration, and then we set the number of supported devices and go to the configuration of the device itself. It should provide the device address, as well as the amount of data and commands of individual classes that we want to use. We can also modify the frequency of communication.



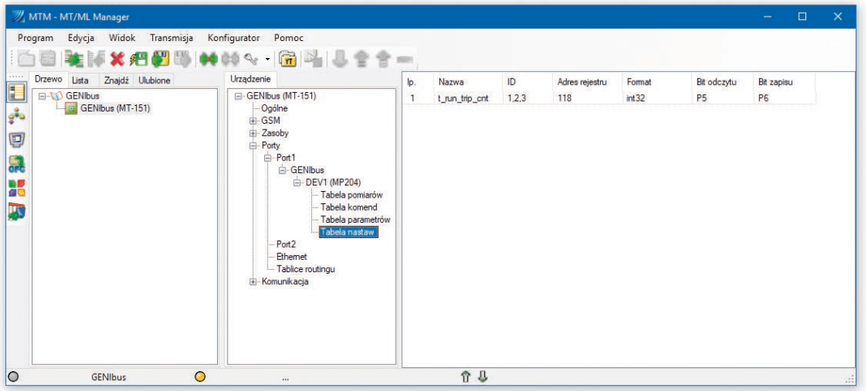
Then we can start adding data and controls. For class 2 inquiries, we use the measurement group. Here we can define the resource ID, data format and register address in the module where the read data will be saved. If the resource consists of more than one ID, separate them by commas. Bits from the group TSLx_ok indicate the correctness of the reading, where x indicates the ordinal number of the measurement.



We define the class 3 commands in the command table. This is done by assigning the command ID to the bit in the module. The rising edge of the bit signal sends the command to the device on the GENIbus. Confirmation of receipt of the command resets the control bit – this allows you to control the correctness of communication.

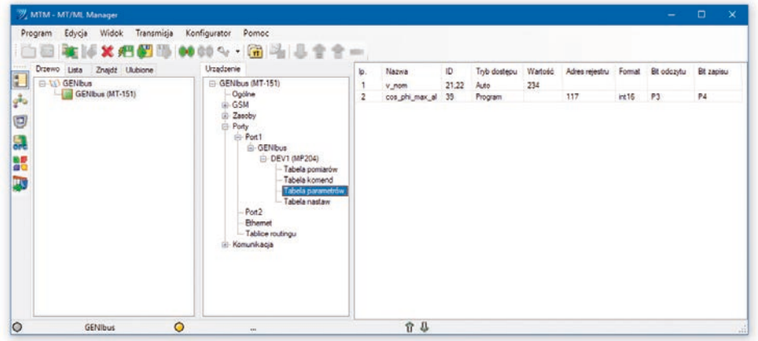


The parameter and setting tables allow you to define the class 4 and class 5 commands respectively. The tables allow also defining two bits – for read and write, despite the command ID, data format and the indication of the register storing data in the module. Setting these bits to high state sends a command to read data from the bus to the register or write the state of the register to the GENIbus device. The delivery of the command is signaled by resetting the control bit.



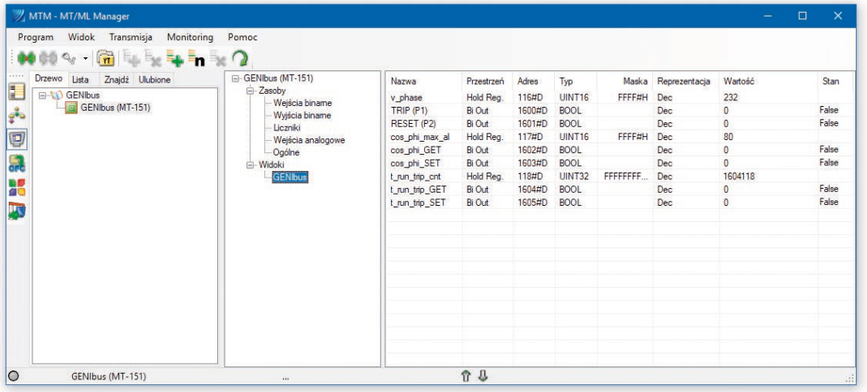
Additionally, the parameter table (class 3) allows you to define the access mode between:

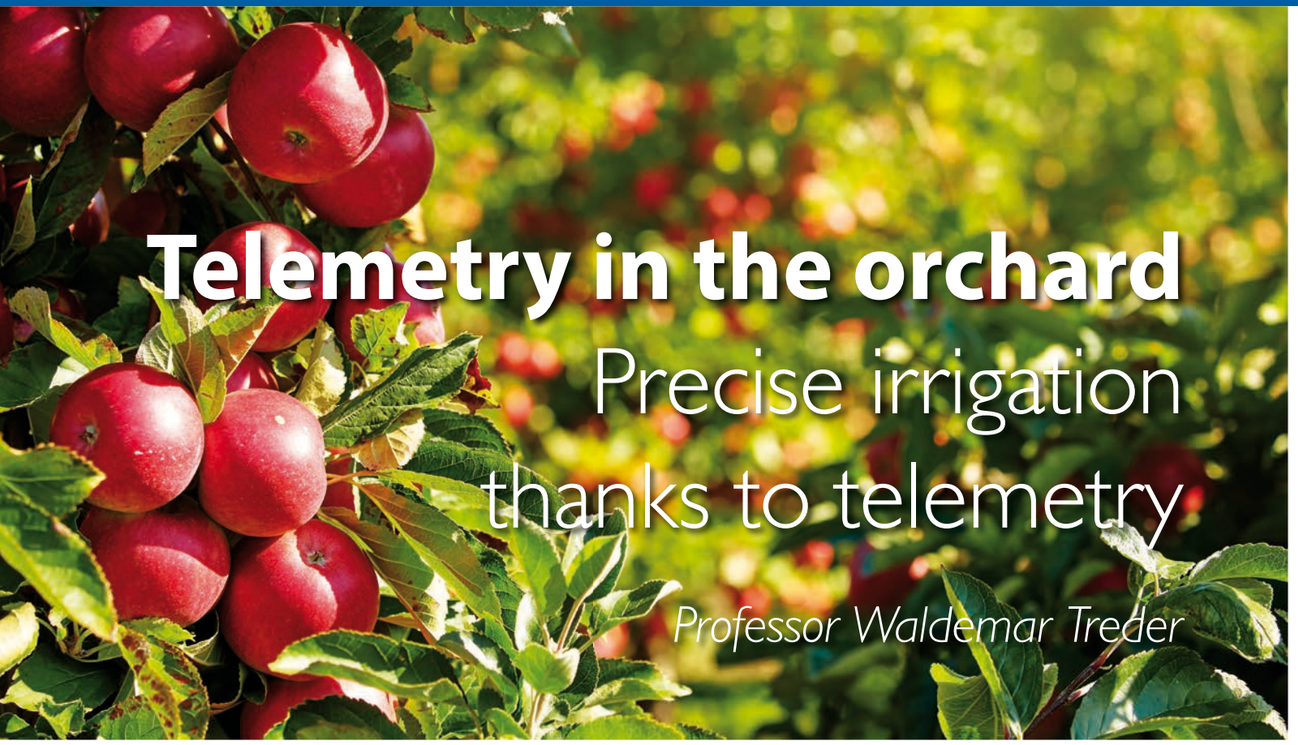
- Program – reading and writing is carried out as described above,
- Auto – the module, after establishing a connection with the GENIbus device, sends the value defined in the Value column using the SET command.



The correctness of communication can be verified using the Monitor tool built into MTManager. From this level, you can view and set values and states stored in registers and bits, thus affecting communication with the GENIbus devices connected to the MT-151 telemetry module via the communication bus.

The implementation of the GENIbus protocol in modules allows for quick, easy and cheap enrichment of GRUNDFOS pump systems with monitoring based on packet data transmission in the cellular network. Thanks to this, with the help of a single device, we increase the potential of the solution by the ability to collect data from a distributed system into one place without having to invest in additional converters.





Telemetry in the orchard

Precise irrigation thanks to telemetry

Professor Waldemar Treder

AGREUS

„„Modern telemetry and automation are not just solutions for industrial applications, in the common sense of the term. They also begin to cover completely new fields in which only marginally they have been used so far. The following article describes the use of telemetry, or as it is currently defined, the Internet of Things, for applications in agricultural production, which has recently turned into a fully-fledged, more and more demanding and modern, agricultural industry.

The immediate reason for including these issues in Telemetron is the fact that three years ago we started the process of diversifying potential recipients of our telemetric solutions including agricultural producers. The eSAD system was created as a result of cooperation with the Institute of Horticulture and personally with Professor Treder. It is currently subject to the commercialization process under the name AGREUS and is being prepared for launch on the market. The sooner this happens, the sooner it will be possible to start our completely new branch of activity: support for modern, precise agriculture, i.e. Smart Farming.

I encourage you to read the article prepared by Professor Treder, the undisputed authority in the field of irrigation and fertigation of crops. The following text describes the complexity of the processes taking place in this field and indicates how useful the modern solutions derived from automation and telematics systems can be. Issues raised are not easy, the terminology is not encouraging, but it is worth to read. This is a new, dynamically developing area of industrial production, so important for the future of the inhabitants of our world."

Jerzy Białousz

Humanity faces the challenge of feeding a dynamically growing population. The only way to increase food production is a further intensification of agriculture. The availability of water is a factor that particularly affects the amount of crop yield and quality of animal husbandry. Unfortunately, most forecasting scenarios predict in the near future a further increase in average air temperature with decreasing rainfall. Limited water resources may in the future be a barrier to the economic development of many regions of the world and negatively affect the condition of the environment and the quality of life of societies. It is, therefore, necessary to take measures to increase water retention, improve water quality and increase the efficiency of irrigation. Agriculture is the main consumer of water in the world. In the European Union, an average of 24% of water consumption is used by agriculture, but in countries with high agricultural culture and hot climate, the proportion of water used for irrigation reaches even 80% of the total consumption. Due to the significant increase in irrigated land area, water consumption in the world increased twice in the 1960-2000 period. Therefore, everything must be done to manage the limited resources of water as economically as possible.

In the scale of the Polish economy, agriculture is a significant consumer of water as well. If we want to compete in global markets, we will be forced to significantly increase the area of irrigated crops, and thus the greater use of water. Unfortunately, Poland has one of the worst water balances in Europe. The reasons for this are low surface water resources, small annual precipitation, high evapotranspiration and the low share of river inflow from outside the country. Renewable water resources in Poland are about 1600 m3 per capita per year, which is three times less than the average in Europe. Another bad phenomenon is the continuous reduction of water quality caused by anthropogenic activities. Unfortunately, in the next dozen or so years it should be expected that the water balance of Poland will deteriorate further. Very worrying is the fact that after the very dry year 2015 severe droughts in 2018 again occurred. Such a frequency of occurrence of very dry years in Poland has not been recorded so far. Insufficient water during the growing season significantly reduces the yield, but above all, it lowers its quality. The only way to maintain a high level of horticultural production is to use irrigation.

In Polish conditions, to ensure high yields of good quality fruits, an average of 100 – 200 mm water (1000 – 2000 m^3 water per ha) should be provided by irrigation. In our climatic conditions, about 200 – 250 liters of water is needed to produce 1 kg of apples. In dry years, about 30% of this water comes from irrigation. These very large amounts of water affect production costs. The significant cost is not only the price of water but also the price of electricity, by means of which water will be collected and pressed into the irrigation system. In the case of water from deep-water deposits, the price of electricity required for pumping can be even higher than the water price. Taking into account the perspective of climate change and anticipated future increases in water and energy prices, irrigation becomes an important element affecting the costs of fruits production. With a certain amount of available water and growing demand (intensification of plant production and climate change), we are forced to use in practice the most effective methods of irrigation. Surveys conducted by us among producers of fruit plants indicate a positive direction for the development of irrigation in Poland, e.g. in predominating orchards (about 78%) irrigation systems in farms are water-saving drip installations. Unfortunately, none of the nearly 1000 respondents knew any method of estimating the water needs of plants. Over 80% of users of irrigation systems declared that the dose of irrigation sets „by eye". Only a dozen or so percent of fruit farms declared using soil moisture measurements. These studies have shown that the vast majority of manufacturers do not use any reliable criteria for estimating irrigation needs, which in practice is associated with very irrational use of water. In most cases, too high doses of water are used, often up to 50% higher than the water needs of plants. Pilot experiments carried out at the Institute of Horticulture indicate that with the proper application of reliable irrigation criteria, water consumption can be significantly reduced to significantly increase the effectiveness of irrigation (yield increase per unit of water used). In practice, we have two groups of criteria: climate and soil. The climatic criteria use calculation models for estimating water needs to determine the amount of evapotranspiration (evaporation from the soil surface – evaporation, plants – transpiration). In the case of soil criteria, irrigation is carried out based on measurements

TECHNOLOGY

Fig. 1 Base Station of Agreus system

of soil moisture (or potential) in the active root zone of plants. Initially, despite the theoretical usefulness, the practical application of this method to control irrigation of plants was very limited. The main reasons are the relatively high price of sensors and soil moisture meters, the need for „manual" measurements and the limited use of soil moisture measurements to automate the entire irrigation control process. Most of these limitations can be eliminated by using wireless telemetry solutions.

Inventia together with the Institute of Horticulture in Skierniewice, Poland, undertook such activities. As part of the program „Measure RPO WM 1.2. Research and development of enterprises", the e-Sad project was initiated. The aim of the project was to develop a system consisting of devices for remote measurement of air parameters and soil in agricultural areas (temperature and humidity of air and soil moisture), as well as modules controlling irrigation valves. The result of these works is the „Agreus" system, whose first prototype elements were presented on June 14, 2018, in the Experimental Garden in Dąbrowice, Poland, on the 21st Open Doors of the Institute of Horticulture.

The heart of the system is a base station that transmits data from/to dispersed terminals, which create a network of sensors and measuring and executive modules. The transmission takes place using a long-range wireless radio network – LoRa. This technology, depending on the terrain conditions, allows covering with its operation a large area of crops with low energy consumption, which is a critical parameter for battery-powered devices. We installed the first base station on the building of the Institute of Horticulture in Skierniewice at Pomologiczny Street 18 (photo 1), obtaining an effective transmission within the Pomological and Greenhouse Complex as well as the Experimental Field of SGGW. The base station of the system can connect to the Internet using the Wi-Fi of the existing local network, independently via GSM (3G, LTE) or, optionally, via Ethernet cable connection. The Internet connection allows you to send the collected data to the cloud-operated portal. Data collected on an individual user account can be used to analyze and generate reports. Very important elements of the whole system are humidity, temperature and salinity sensors AM-100 (photo 2), air temperature and humidity sensors AM-200 (photo 3) and a radio-controlled valve station AM-421, developed by Inventia and tested by the Institute. The AM-421 is an executive module that allows independent control of four irrigation system valves activated by 9 VDC. This solution allows for the introduction of irrigation control automation everywhere where for some reason (technical or economic) the control cables have been impossible to install.

Any displacement and remote reading of the measurement sensors allows the integration of both criteria for irrigation of plants (climatic and soil). Irrigation can be carried out based on the estimated indicator evapotranspiration (ETo), and the sensors can monitor the soil moisture in order to „manual" or automated introduction of necessary adjustments of the doses used and the irrigation frequency. A much better solution, however, is the automatic control of the operation of individual valves based on constant monitoring of the soil moisture measured in the area of the active plant root zone. In this case, the valve will open according to a defined schedule, if the soil moisture falls below a predetermined threshold. Thanks to the telemetric solution, the humidity, temperature and salinity of the soil can be measured anywhere in the entire area covered by the data transmission system. The information obtained here allows you to make decisions not only about the need for irrigation, but also fertilization or fertigation (fertilization with irrigation). The AM-100 probe directly measures the soil's electrical conductivity **σb** (so-called bulk EC), but with the calibration models on the Agreus platform, we can also determine the electrical conductivity of soil with full saturation of the water **σe** (saturation extract EC) and electrical conductivity of water contained in soil pores **σw** (pore water EC). The direct transfer of the results of electrical conductivity measurement (**σb**) to making decisions related to fertilization is practically impossible, as mechanical parts of soil and soil pores filled with air significantly modify the measurements. The measured values are very low, and their level depends not only on the actual salinity of the soil but also on the current humidity and primary air-water properties of the soil. With appropriate conversion models, the user also receives information on the potential content of mineral compounds in the soil (**σe**). The ranges of the **σe** parameter for many plant species were determined experimentally in the USA and for many years, they serve as information for making decisions about fertilization of specific plants. The quality of mineral nutrition of plants is affected not only by the soil's richness but also by the concentration of mineral compounds in the soil solution. Due to the drying of the soil, the water content in the soil pores decreases with the simultaneous increase in the concentration of mineral compounds dissolved in it. Excessive concentration of fertilizers initially only limits their uptake, but in extreme cases can lead to a physiological drought. The soil moisture measured by the AM-100 probe and the estimated electrical conductivity of the water contained in the soil pore (**σw**) allows optimal control of irrigation, taking into account the soil's abundance.

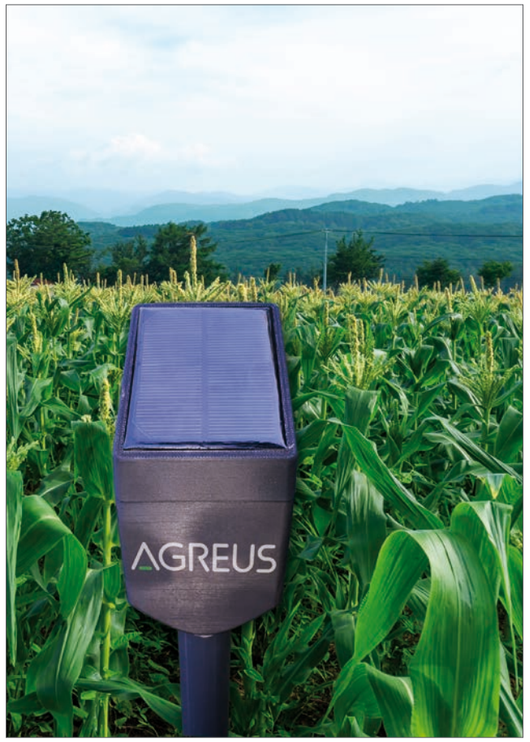


Fig. 2 Humidity, temperature, and salinity sensor

Agreus is obviously not only irrigation and fertigation. The temperature and humidity sensor we tested can be very useful for monitoring these parameters in the spring in the period of frost. Reliable information about the current temperature in various places of the orchard is necessary for active protection of orchards against frost. Based on our first research and observation, it can be stated that the possibilities of using modern telemetric systems in orcharding are very wide and the direction of their development will depend on the needs of users.

Fig. 3 Air temperature and humidity sensor AM-200

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

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TECHNOLOGY

Irrigation according to the set plan

Interview with President Jerzy Bialousz at the Gardening and Vegetable Trade Fair in Nadarzyn

In the world of Internet, modern technologies and concepts such as telemetry, LoRa, Farming 4.0, which we do not quite understand, and which from all around „attack" us in descriptions of devices or techniques, one can get lost. The same was true of the modern irrigation systems that are already appearing on the market, and whose operation and service will have to be learned in order not to be left behind. Such systems are introduced by Inventia, which tested them for several seasons in cooperation with the Institute of Horticulture in Skierniewice, in the Irrigation Workshop under the direction of Professor Waldemar Treder.

What is telemetry? Can you explain to growers what it can be used in a horticultural farm?

Jerzy Białousz (Inventia): Telemetry is a concept better known from automation and industrial processes, but it can also be used in modern agriculture. In both cases, it is about remote data acquisition, possibly extended by remote control. What is also important, this acquisition can be carried out without any human intervention, of course after proper preparation and configuration of the necessary equipment.

In agriculture, telemetry gives enormous metering capabilities, unavailable until now, that influence the agrotechnical decisions regarding crop and climate parameters. The extent of cultivation makes it very difficult or even impossible to make frequent manual measurements, so telemetry enabling remote measurements becomes the only reasonable alternative. Only currently acquainted data can be the basis for accurate decisions. Of course, the question remains what data we want to acquire and whether suitable sensors are available. The development of sensors is only a matter of time, while the fact of the possibility of remote data acquisition is such a huge improvement over the current situation that it can be the basis for the creation of various systems based on it. Agriculture is still treated, from the metering point of view, as a backward area. It consists of both the lack of possibilities and the resulting lack of formulating needs. Few solutions are extremely expensive, i.e. beyond the reach of potential users. The use of relatively cheap, universal telemetry in agricultural production is aimed to change this situation, leading to a better knowledge of the ongoing processes, increasing yields and lowering the production costs. This is the way agriculture should be treated.

Can you explain other concepts like the Internet of Things or Agriculture 4.0? These are still new terms for the majority of gardeners...

J.B.: „Agriculture 4.0" is a very informal term created in the similarity to the one functioning since 2011, i.e. the „Industry 4.0" introduced at the Hannover Trade Fair by the Federal Government of Germany. This term means a new trend in contemporary, mutual use of automation, data processing, and exchange as well as manufacturing techniques. Similarly, the term „Agriculture 4.0", although not officially introduced, means the same integration of digital technologies, but for the needs of agriculture. This is a clear reference to the current stage of the Fourth Industrial Revolution, whose benefits and the resulting benefits should have an impact on the development and increase of agricultural production efficiency as well.

The term „Smart Farming" or „Precision Agriculture" is probably better than the term „Farming 4.0". Under these names are all solutions, both hardware and software, aimed at increasing the efficiency of agricultural production while reducing its costs, reducing the involvement of the human factor and facilitating the necessary supervision. Personally, I am closer to these terms than to „Agriculture 4.0", because they refer to the significant advantages of solutions that give tangible results.

As for the term Internet of Things, also hiding under the English-language acronym IoT, it mainly refers to the hardware layer of the issues discussed previously. However, this term is very wide and includes more and more technologies and related services that are supposed to open completely new horizons of our digital life, enabling the creation of previously unavailable services. As you can see, both Farming 4.0, as well as Smart Farming, or the Internet of Things, refer to the same inevitable sphere if we want to think about progress and the digitization of work and everyday life.

In addition, what is LoRa, because with this concept you can also often meet in the context of „transport" of various data?

J.B .: LoRa is one of the latest technologies enabling wireless data transmission over long distances. The term „long" is of course relative, but in this case, we deal with point-to-point data transmission. Therefore, we cannot compare the scope of this technology with, for example, ubiquitous GSM technology, because in the latter case we are dealing with a transmission system created by his operator. Practically LoRa has, depending on the terrain conditions, a range of a few to a dozen or so kilometers, which is enough for the planned applications. An undoubted advantage of this technology is its low energy demand. This translates into the possibility of creating remote, wireless, sensors or executive modules, which can work with minimal energy expenditure, and therefore can be

powered by battery or solar cell. This is especially important in agriculture, where field scattering is high and the availability of power sources is limited. Wireless systems also make it easier to create mobile solutions, that is, requiring frequent change of location, which would be impossible if it would involve the need to change the position of the routed cables.

What features (capabilities) has the Agreus system presented by your company?

J.B.: The Agreus system is our answer to the growing demand of the agricultural market in the area of obtaining data necessary to manage crop management. For years, we have been dealing with professional telemetry for applications in industrial automation. The Agreus system means transferring our knowledge and experience in a new direction. It means a new, dynamically growing market. It is difficult to talk about the functionality of the Agreus system, because by definition this system, as an open system, is to measure and automate all spheres related to agricultural production. It is easier to describe the functionalities with which we want to introduce this system to the market, or what we will offer at the beginning.

What parameters can be monitored using this system?

J.B.: The world in which we live knows only two types of measurement quantities – binary or analog. We do not think about it on a daily basis, but it is just that something is either 0/1, e.g. closed/open, or continuous values from a range, e.g. temperature. This greatly facilitates the creation of telemetry systems, because we only have two types of quantities to send, although the interpretations of individual readings may vary. The limitation is, however, to have the right sensors for the needs, and here we also see our role as a company offering solutions tailored to the needs of agriculture. We already have some of the products, others are in development, but we know that it is a continuous process, largely stimulated by the needs of the market. Using the reference to familiar things, Agreus is the „Lego" for Smart Farming. All the blocks fit together, you can build various solutions, and in the offer, there are still new opportunities stimulated by the needs of the market.

Will the main function of the system be irrigation, or are you planning to develop other functions?

J.B.: Initially, the Agreus system will be focused on the precise irrigation and this will limit its functionality. To be able to irrigate precisely, that is, according to the needs of cultivated plants, we need to know the weather conditions at the place of cultivation or to monitor the soil moisture at which these crops are grown. Therefore, one of the first sensors will be a wireless profile sensor to determine the humidity, temperature, and EC of soil, which may be the basis for the decision to carry out irrigation. The control of the irrigation itself will also be remote, without the necessity of laying control cables. It regards both the systems supplied with 24 VAC and systems with a battery (9 VDC) or solar power supply. The pressure and the amount of used water will be measured as well, which will give us a picture of the effectiveness of the irrigation. In conclusion, in the first stage, the Agreus system will enable us to create a control for a well-metered irrigation system with a full, historical picture of the activities. On the one hand, this will allow you to optimize water consumption, and on the other hand, will give the base for inference for the future. However, as I said, this is not the end. The assumption of the Agreus system is its openness to the users' needs and we will strive to satisfy them.

How is the system being built in practice and does its components vary depending on the needs of the farm?

J.B.: Because we are dealing with a professional system, as in any such case, its creation must be subject to design processes, carried out preferably by a specialized company. Of course, it is also possible to create yourself your own system, but in any case, we must first determine what we really expect, or how it is supposed to work. Of course, this leads to the fact that each user will have a different customized configuration. Agreus is prepared for it because it is freely configurable as long as the basic requirements are met. This is the system that allows you to create an optimal configuration with the possibility of expanding it if needed. There are also no territorial restrictions if only we are within the working range of used technologies: LoRa and GSM.

Do I understand correctly that the system can be managed without leaving home using mobile devices, such as mobile phones or tablets?

J.B.: Yes, of course. So far, we have not mentioned a very important element of the system, which is the internet portal. The Agreus portal is a cloud-based internet application that allows you to collect and visualize sensor data and to manage irrigation. Irrigation is carried out according to the schedules established on the portal directly from the Base Station installed on the farm, and being the central point of each system. It provides communication between the sensor and executive modules and the portal cloud. Because the Agreus portal is available to users with an open Internet account, access to it is territorially unlimited from any device with an Internet browser. Additionally, for the Android users, and soon for those who have chosen the Apple solutions, an application of slightly different functionalities, which are characteristic for mobile devices, will be useful. This is not the time and place to calculate all the advantages of the solution we have applied. The most important is that, as you said in your question, we do not have to leave the house or return from holidays to find out how our farm works and whether our crops are safe. Yes, the achievement of maximum crop safety is the primary purpose of the Agreus system.

On which farms do you recommend installing the system? Is it only in the largest ones, or also where the plots are, for example, scattered and there are difficulties with access and manual control of devices?

J.B.: Probably initially, the Agreus system will be used in relatively large and modern farms. However, I hope and with this thought it was created, that also smaller farms recognize its usefulness in everyday work. The system has no restrictions upwards or downwards. It can be a single soil moisture probe or one wireless module for controlling valves or lighting the area. The only condition is to have the Agreus System Base Station, i.e. the heart of the hardware solution. Subsequent measuring or executive modules will simply be added to it.

The use of the system on distant plots without daily or frequent supervision is a perfect example of their capability. Because in the base station we combine LoRa with GSM technologies, while the range of any GSM network is available on a remote plot, it is possible to install the system even where there is no permanent power source available. Solar technologies provide us with relief, allowing us to supply both the Base Station and the solar modules themselves. It is the energy source being sufficiently effective to enable proper operation of the devices. Moreover, when the system is already installed, we gain the possibility of remote supervision and control regardless of the distance and location of the plot or object, because it must be strongly emphasized that the Agreus is not only irrigation but also many, many other possible functionalities and applications.

We already know all the advantages of the Agreus system. Is it possible to calculate system costs in a transparent way?

J.B.: I would not like to reveal all the details yet, because the full commercialization of the Agreus System is planned for the second quarter of 2019, but we can already talk about the model in which it will be sold. The basic elements of the system will constitute an offer of our or our Partners, while the use of the System, i.e. the use of the Agreus portal, will be paid in the subscription cycle, probably on a one-year basis. All additional services will also be available in the subscription option, and technical support will be obtained at the place of System purchase on terms agreed with the seller.

As for the prices themselves, we anticipate a level that allows you to get a return on investment as soon as possible. Obtaining direct savings and convenience of use is the basic goal of using the Agreus system, so the price of the solution should be adequate to its capabilities. We also intend to create the possibility of sharing data with agricultural advisors cooperating with us and with our clients. I think that it can significantly improve the quality and speed of their services based on widely available and always up-to-date environmental data.

Thank you for the interview, Dorota Łabanowska-Bury.

Photos: Dorota Łobanowska-Bury

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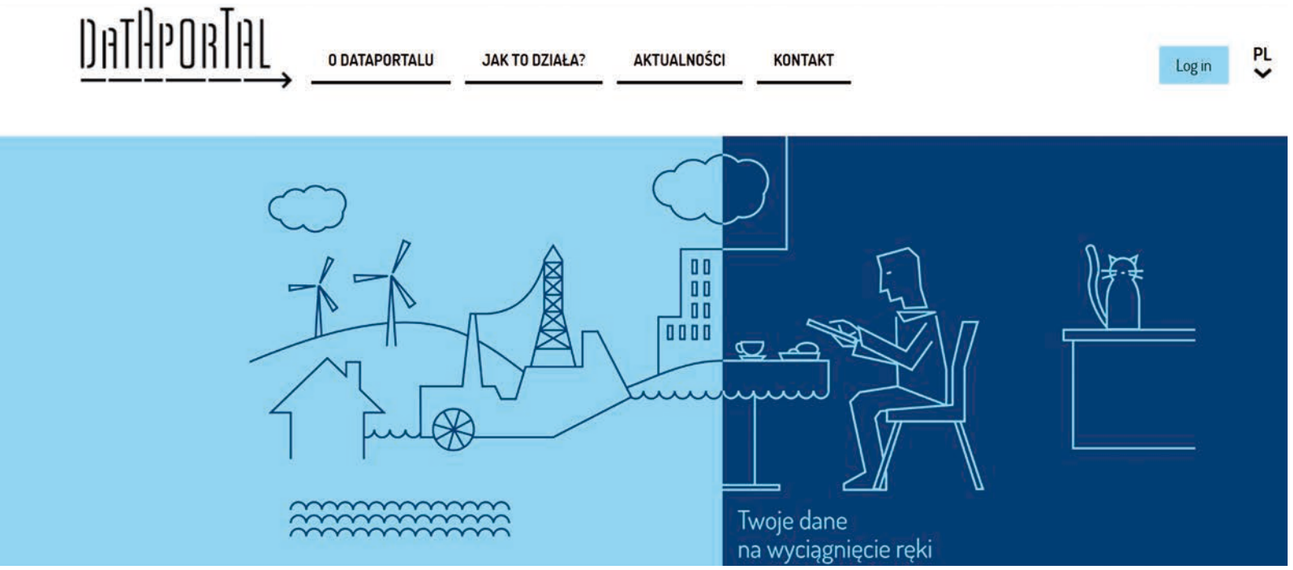
TECHNOLOGY



SCADA 4.0

DATAPORTAL.ONLINE

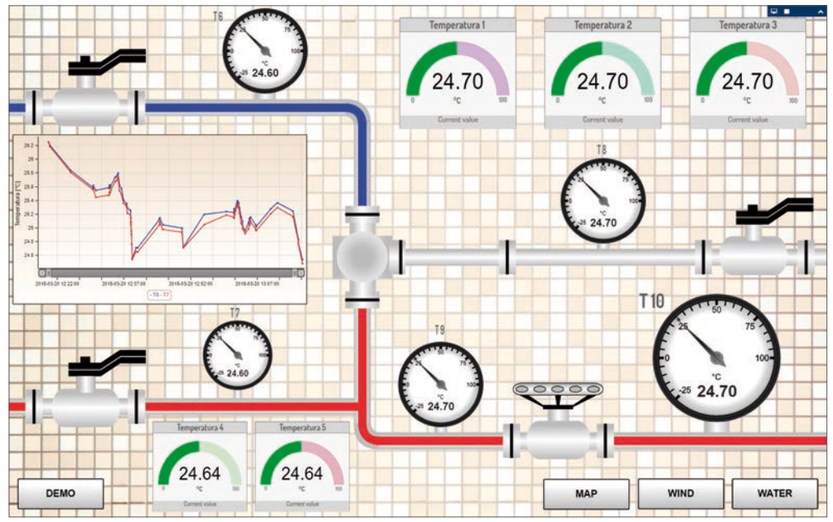
Inventia has been producing electronic devices for almost 20 years. However, the company is known primarily from telemetry modules. Our most popular MT-101 model is still available in the offer. To this day, devices from the beginning of production, that is 2001, are still working. We are very proud of it. Since that time, the team of people working on joint success has considerably grown. New specialists came in complementing and expanding the capabilities of our development in the directions in which we have not yet moved. All the time we implemented new ideas and met the requirements and needs of our clients. Dear customers! Some were very specific, difficult to implement, almost impossible! They required an individual approach and had to be designed for specific applications. Most often, however, the Support Department, receiving a phone or an e-mail, received repeated two questions:

1. How to present the information registered by the module?
2. How to implement data hosting from telemetry devices?

As a standard, first, we responded that you could buy a license for any SCADA system and use the MT-Data Provider software provided with our modules. Secondly, you can develop your own interface to access the information gathered in the database using the mtlib communication library. In both cases, it is necessary to provide for additional costs related to the purchase of equipment and the time needed to build your own core system. Both methods are reliable and proven, still used and in many cases even required. Both are quite labor-intensive in implementation. We have therefore found a way to minimize the costs and time needed to quickly achieve the goal. For several years, we have been testing and developing our own visualization system designed to work in a distributed environment, commonly known as the cloud. Thanks to the joint work of the combined team of our engineers and programmers, we also propose a third way. We hope and we believe that this may soon be the number one method!

HOW IS IT WORKING?

DataPortal is a SCADA system that works completely in the cloud. User is required to have only the access to the network and the telemetry module. Additional licenses or specialized computers playing the role of data servers are not required to create and display screen graphics. All operations related to the correct operation of the system are invoked in a dynamically scalable environment. A load of processes included in the DataPortal cloud, such as the collection of data from devices, their analysis and processing, and delivery to the recipient, are under constant monitoring. That is why we can provide a fully balanced, stable environment for small and medium-sized as well as large systems. While designing the structure, we anticipated appropriate mechanisms for migration and scaling of resources used during system development. The user does not have to worry about it. This is on our side. For its part, it has access to the cloud management panel from the level of the web browser. To start, just register our telemetry module on the DataPortal.online website. It is also very important to have a SIM card with an IP address in telemetry.pl, because data are currently sent to the cloud only from this subnet. The next step is to configure the device to communicate with DataPortal and create animated screen images. Here the step-by-step guide prepared by us and available after logging can help. In more difficult situations, please contact our technical support. The time it takes to create a simple screen is a few minutes. We draw screens taking ready-made elements and placing them appropriately in the working space. More complex projects with many screens consisting of more detailed graphics require more work, respectively. We have not optimized this yet, but we are working on ready-made templates that will significantly speed up the process of drawing the repetitive patterns. We animate the finished screen and switch to traffic mode to see if everything behaves as it should. We can make changes and modifications at any time. We can add another device to the cloud, and display the data sent from it according to your idea.



DATAPORTAL FEATURES

VISUALIZATION OF DATA ON ANIMATED SYNOPTIC SCREENS

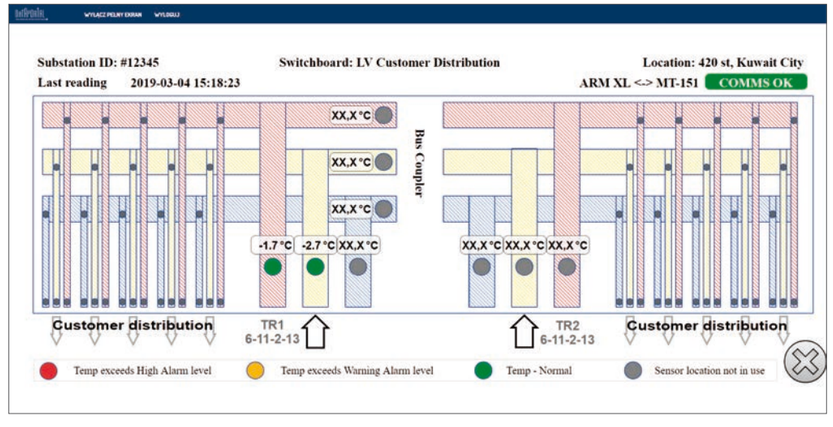
It is the basic function implemented by the system. The information recorded by the measuring devices is converted into graphic form. Most often, it is a graphics created by the tools available in the Design mode. They can also be various types of charts, tables, map, as well as other predefined graphical objects.

PROCESSING OF ENTRY DATA

The incoming measurement data, in addition to storing, can also be transformed mathematically or logically. We will save the new data in the converted form in the new matrix. Arithmetic and logic functions are available, with the help of which it is possible to calculate complex actions according to the introduced formulas.

ALARMING AND MESSAGING

A very important element in control and measurement systems is the detection of undesirable or emergency situations, and currently more and more often used the prediction aimed at preventing such events. In both cases, the alarm is to be registered and the staff must react accordingly. In DataPortal, we have embedded alerting mechanisms with SMS or email notification. These services operate optionally and are independent of notifications launched directly in telemetry devices.



CONFIGURATION OF MT MODULES

DataPortal can also be adapted only for remote management of the configuration of distributed devices that are connected to it only for this purpose. For now, it is only a configuration (selected models), but we also have an idea for programming and monitoring from the cloud. Full module manager named webMTC is available in the browser.

DATA HOSTING

If we only have to collect measurements and we do not need animated screens, we do not have to draw them. Perhaps as standard, it is enough for us to preview the values we collect in the form of a table. The cloud is equipped with more and more filtering tools that display desired data sets from a given range. The filtered results can be downloaded in the form of comma-separated files. Moreover, we have then ready data hosting.

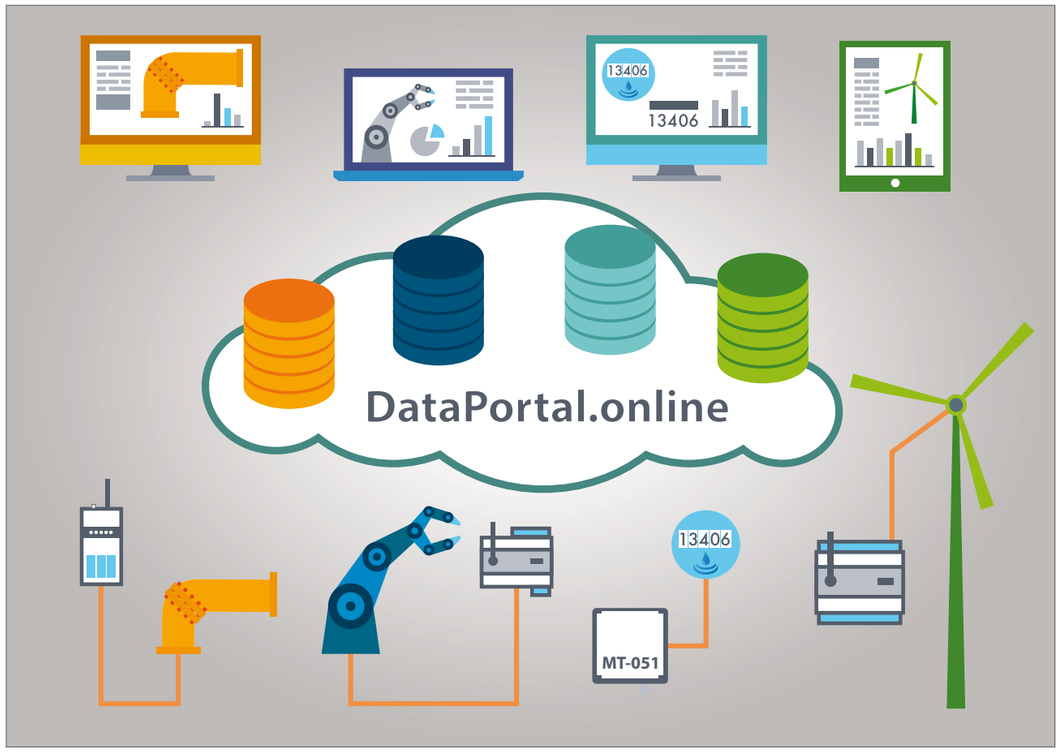
USAGE

Applications are different and practically unlimited. Our clients will definitely come up with something incredibly unusual and will do their own visualizations at their own discretion. So far, our clients have implemented, among others:

- Control and monitoring of hydrophores and sewage pumping stations
- Predictive monitoring of electrical switchboards with an SMS and email notification system
- Control and monitoring of the operation of current generators
- Monitoring of the parameters of the cathodic protection station
- Graphical reports on water consumption based on a remote reading of water meters
- Acquisition of data on the mining of lignite from coal mines scattered around the world to the customer's server
- System for monitoring of liquid parameters along with notification of exceeding the acceptable quality.

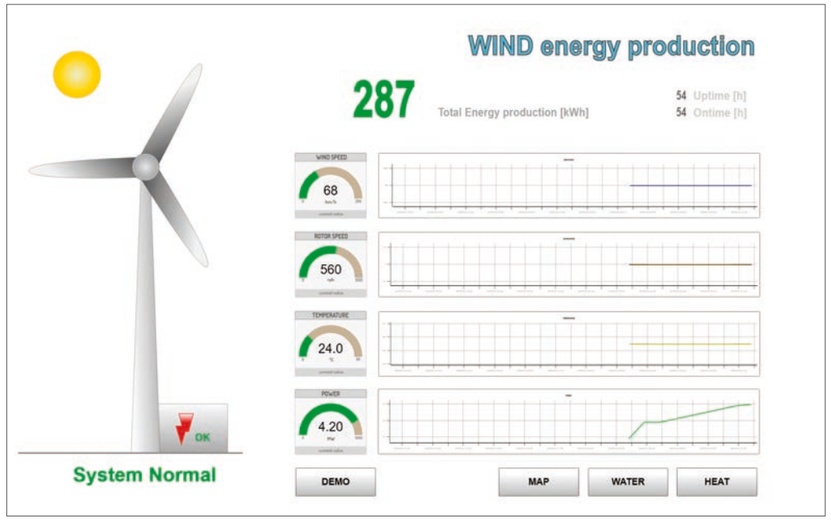
SYSTEM-IN-THE-CLOUD BENEFITS

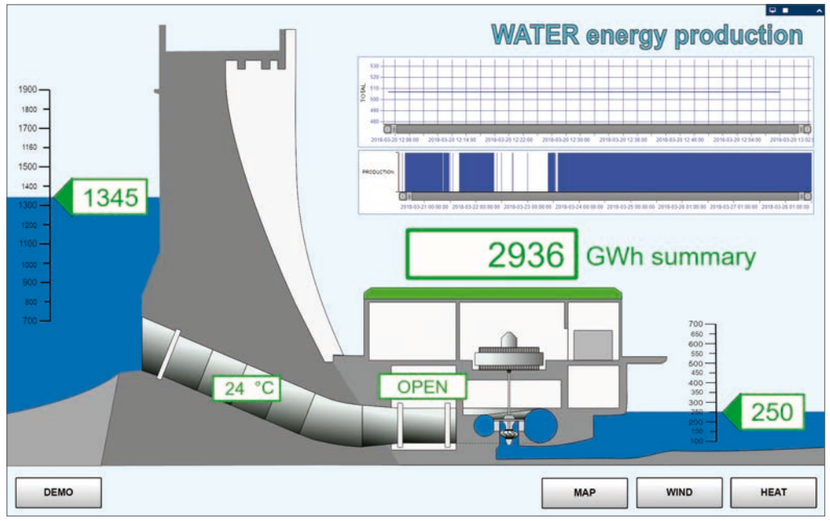
- Presentation of data in an individual graphic form defined by the user
- Access data from anywhere on Earth
- Multiple concurrent users with different privileges.
- Preview on devices of various types
- Automatic scalability as the system grows
- Pay per View – the user pays only for used system components. For large systems, a flat-rate subscription option is available.
- Cost savings associated with building and maintaining your own server infrastructure. We do not require hardware access to cloud resources. The web browser is the only required software.
- Alerting with notification via email or SMS
- The visualization works without interruptions even when the operator is logged out
- Support when creating your own system

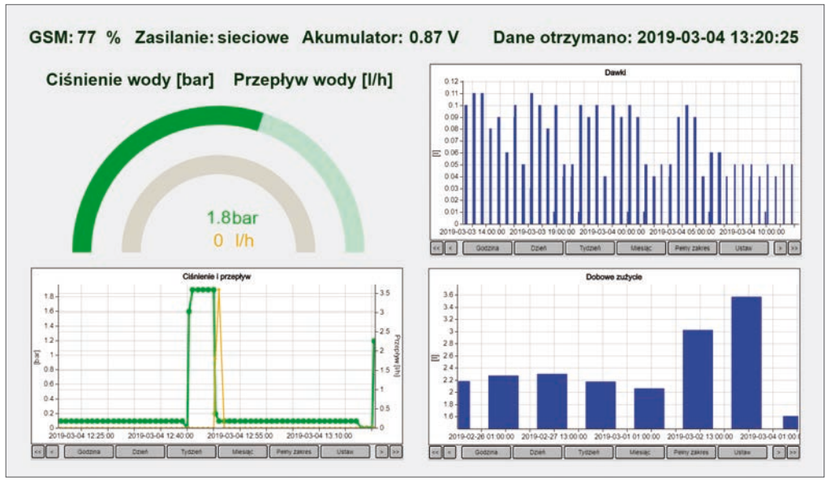


Dataportal.online

Your data at your fingertips







Mobicon MT-151 HMI controls the work of the pumping station

Mateusz Labuda – MPWiK, Lębork, Poland

In 2014, the Municipal Water Supply and Sewerage Company (MPWiK) in Lębork, Poland, considered changing the method of remote communication between the dispatching center and more than twenty pumping stations. This was connected with the planned modernization of the Local Sewage Pumping Stations.

Up to now, information on pump status and signaling alarm from pumping station has been sent using radio modems operating in the UHF band, independently of the control system. The PLC controller was applied in the data exchange between objects and the SCADA system used to visualize the network of Local Sewage Pumping Stations. The task of PLC was to collect data from radio modems and transfer the received information to the server via the serial interface.

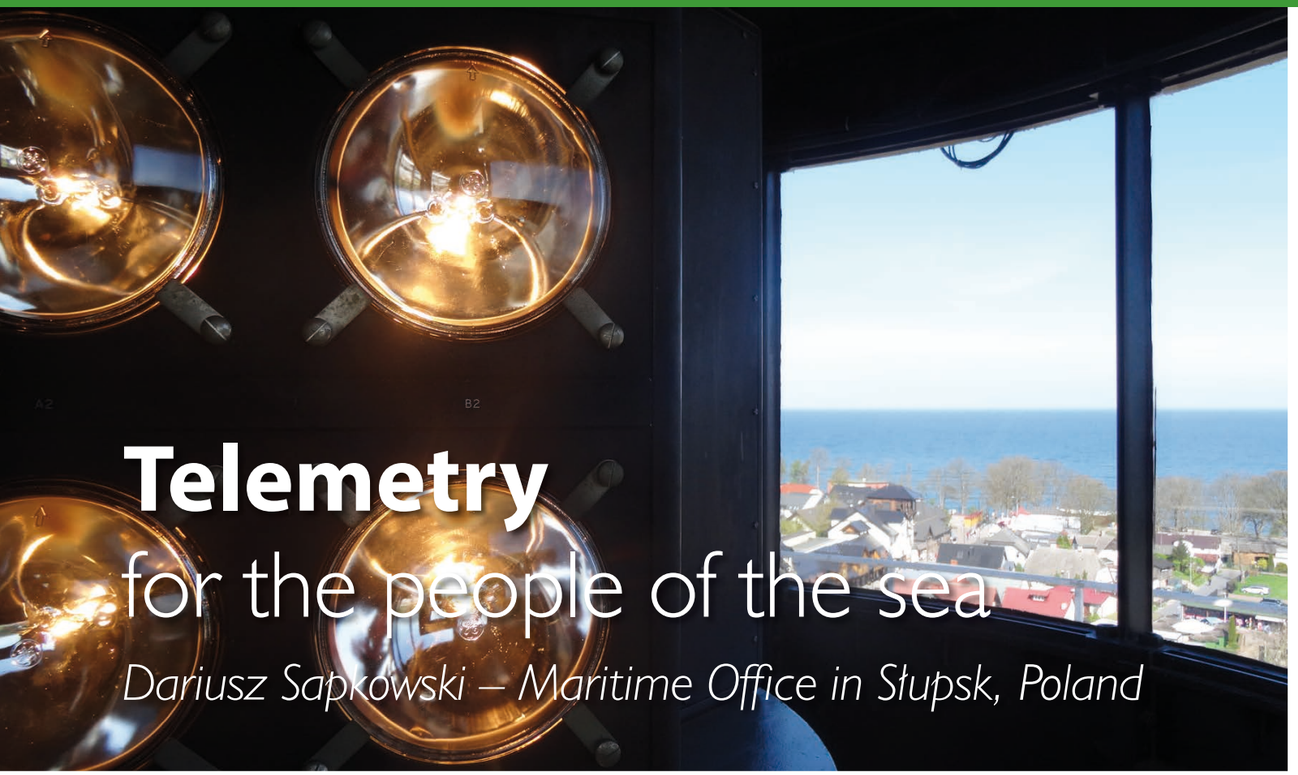
The quality of communication or its maintenance at all is strongly influenced by atmospheric conditions and environmental factors (change of tree stand, change of city development). While at some pumping stations communication in the UHF band functions without any problems up to now, on other, more distant and/or worse located, the quality of communication has dropped significantly, communication fails appeared or communication has been even stopped. The decrease in the quality of communication caused definitely more frequent trips of maintenance staff to such objects, and thus increased the costs of their operation.

When looking for an alternative to the existing solution, it was decided to use the Inventia Mobicon 151HMI module combining the advantages of the PLC and the 2G/3G communication module. It allows for free programming of the pumping station and its rich resource of inputs and outputs allow you to connect all signals. Two serial ports (RS-232 and RS-232/485) and an Ethernet port allow communication between the module and devices supporting open protocols Modbus RTU, Modbus ASCII, Modbus TCP/IP, or M-bus.

The built-in 2G/3G modem allows you to send statuses and alarms from objects to the server. Free configuration software and OPC server enable the integration of modules into existing SCADA visualization system.

Using MTDataProvider, which was made available free of charge by Inventia, in 2015 the MPWiK modernized three local sewage pumping stations by its own forces. Currently, eleven pumping stations belonging to MPWiK Lębork from a total number of 25 were modernized in the same way. We are at the stage of modernization of the next six control panels with Inventia modules – commissioning is planned for the beginning of 2019. Ultimately, the expansion of the sewage system is assumed, which will additionally increase the number of operated Local Sewage Pumping Stations to over thirty. Due to the failure-free operation of the system, by 2020 a total unification of the telemetry system in the company is planned. The solution will be the Inventia modules.

MPWiK Sp. z o.o.
LĘBORK



Telemetry
for the people of the sea

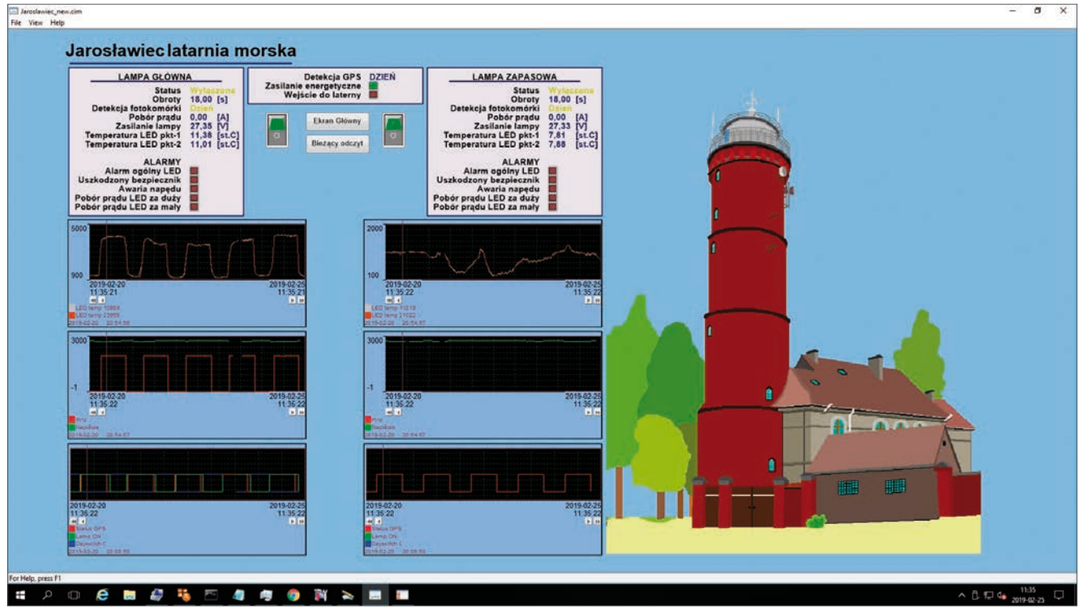
Dariusz Sapkowski – Maritime Office in Słupsk, Poland

The Maritime Office in Słupsk was established in 1954 as the Koszalin Maritime Office. Under the current name, it has been operating since 1975. It is one of the three Maritime Offices in Poland – the others are Maritime Office in Szczecin and Maritime Office in Gdynia.

The main task of the maritime office is to deal with matters regarding government administration related to the use of the sea, within the scope regulated by laws and international agreements. These matters include, above all: navigation safety and harbor order supervision along with ensuring navigability of sea routes and ports, supervision over the protection of the marine environment and protection of the seashore by construction, maintenance and protection of shore strengthening, dunes and protective forests on seashore, navigation markings on sea roads, roadsteads, anchorages, and in harbors and marinas.

Starting from 2006, the Maritime Office in Słupsk uses a telemetric system based on Inventia modules to control the work of devices related to maritime safety, such as lighthouses or buoys. They use MT-101 and MT-713 modules. Further upgrades of these devices or the expansion of the system with new devices will undoubtedly increase their basic functionality by the possibility of remote monitoring using Inventia modules.

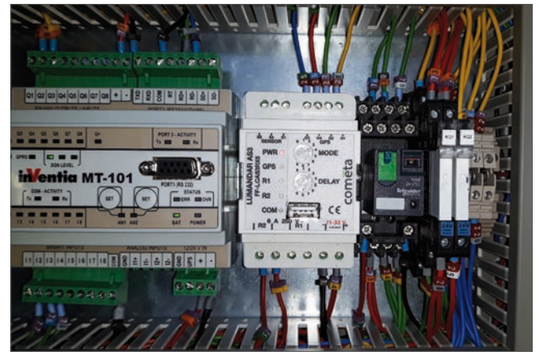
Subsequently, in 2017 and 2018, the Maritime Office in Słupsk modernized old navigation lights in Kołobrzeg and Jarosławiec lighthouses, where the MT-101 modules were used as well. Microprocessor-controlled



modern devices made in LED technology have replaced previous light sources. An earlier solution consisted of the rotary tables with navigation lamps working since the middle of the seventies of the last century. These lamps had a short lifespan (up to 2000h) and characterized by low energy efficiency. Their power was fed using a special mercury pan, which ensured the ability to control the high currents necessary to power the rotating lamps, but it was not a safe solution for the service.

The navigational lights currently used in the lighthouses mentioned above constitute a set of two lamps, i.e. main and backup, which is switched on in the case of failure of the first one to maintain the continuity of the lighting.

The MT-101 modules in these lighthouses support information coming from the navigation lamps then send them to the server with the SCADA type application and generate alarms. Additionally, in the Kołobrzeg lighthouse, the MT-101 module is responsible for switching the main lamp to the backup one. This solution allows remote viewing of the lighthouse operation status from any computer with access to the server without the need for installation and maintenance of network cabling. Use of private APN network ensures the security of data sent.



URZĄD MORSKI W SŁUPSKU

Telemetry modules in Control System applications

Maciej Sawicki – Control System, Poland

Advanced functionality of the new generation InVentia telemetry modules MT-151, MT-331, MT-713/723 in applications developed and implemented by the Control System company – edition 03'2019.

Introduction

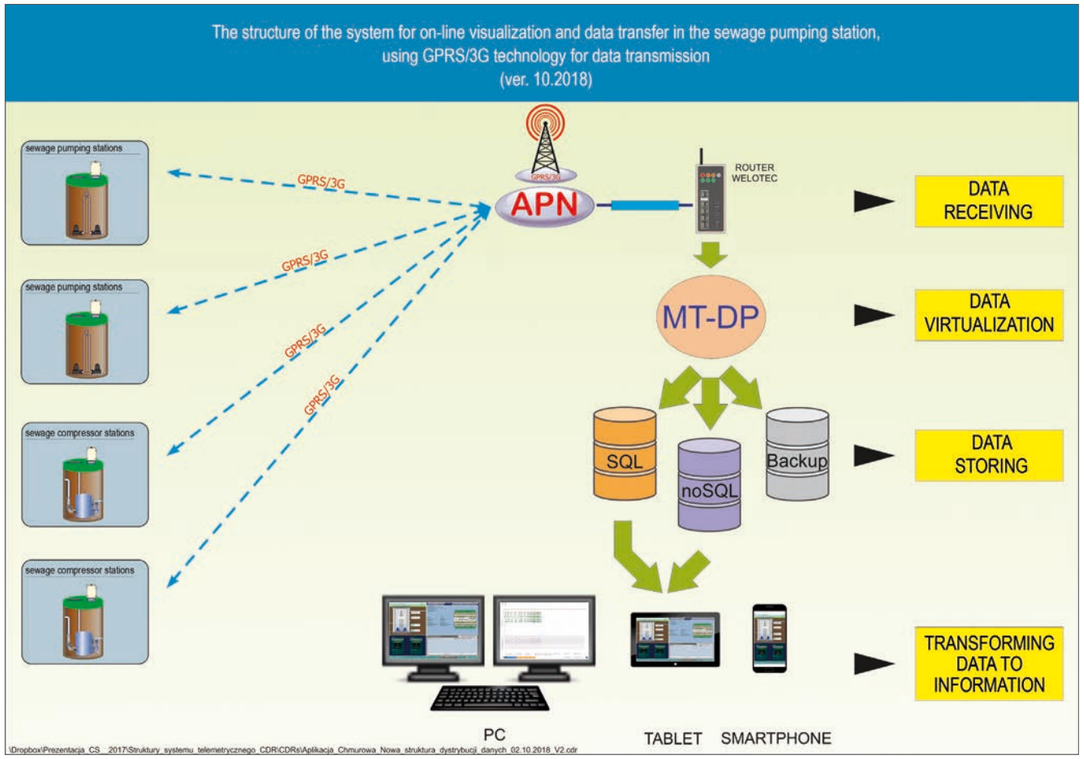
Dear readers of the TELEMETRON magazine, we are giving you another article containing the description of the most interesting solutions implemented by the CONTROL SYSTEM engineers. Traditionally, this article is a continuation of publications contained in the issues of TELEMETRON magazine from 2008 – 2018.

In this edition of the article, as in previous years, we would like to introduce to TELEMETRON readers the most interesting and technically advanced implementations done in 2018 together with partner companies and independently by an experienced team of CONTROL SYSTEM engineers. We have been consistently focusing on the implementation of topics requiring specialist knowledge and many years of experience. However, we remember that our main goal is to create high-quality applications that guarantee users that they will receive the product they expect.

The applications implemented by our team in 2018 were dominated in over 90% by MT-151 LED and HMI telemetry modules. Such a large share of the MT-151 V2 series resulted from the fact that the application conversion process, prepared by us years ago for the MT-101 modules, to the MT-151 V2 platform, was completed. As a result, all new installations are currently based on MT-151 V2. In addition, subsequent versions of the firmware developed by InVentia engineers in 2018 contributed to the increase of functional capabilities offered by this series. Responding to the needs of our users, InVentia has prepared a special version of the battery module MT-713, which has been used in professional applications for monitoring measurement points on clean waterbuses. Moreover, industrial routers TK525 manufactured by WELOTEC have become a standard performing the role of communication gates and offering data transfer using 3G technology.

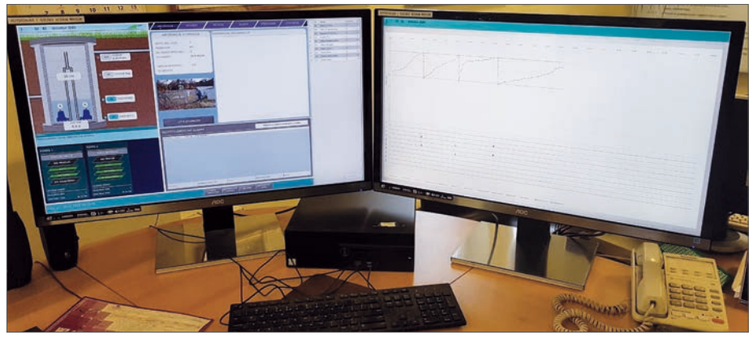
The closing balance of 2018 is almost 11,000 telemetric modules working on facilities in Poland and Europe, with application software developed by CONTROL SYSTEM engineers.

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



The new version of the SCADA system for the visualization of sewage pumping stations + MT-151 LED module as the obligatory standard of control cabinet equipment at sewage pumping stations

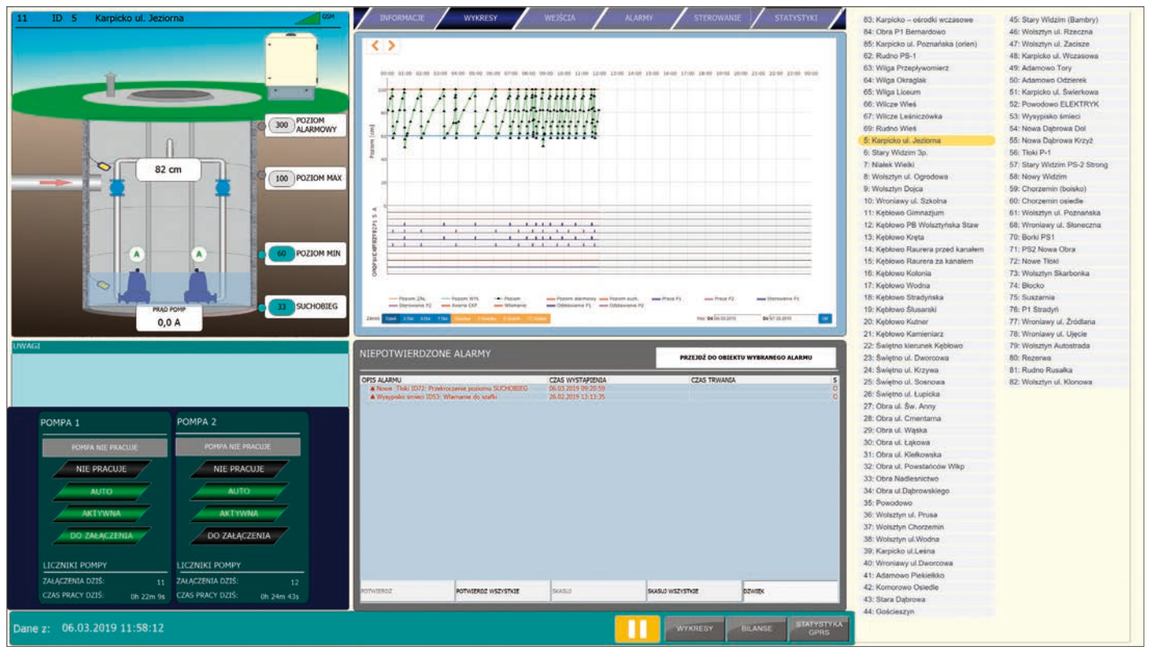
The year 2018 was a breakthrough for our team, among others in the aspect of implementing the newest version of the sewage pumping visualization system on the Polish market. The new architecture of this system, based on the latest available IT solutions and the introduction of numerous useful features not available in the previous version, combined with a very high level of implemented security and operational stability, guarantees users the ability to use the system for years without fear of losing compatibility with the latest version of the WINDOWS 10 operating system.

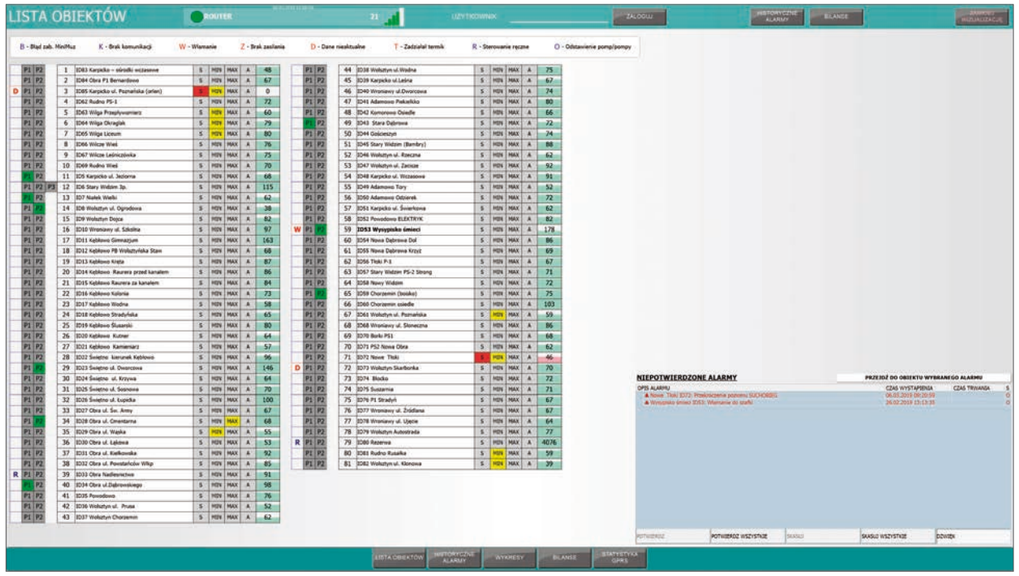


In accordance with the current trends, the new system provides secure access to data from the devices either running under the control of WINDOWS 10 or running under control operating systems for mobile devices, i.e. Android or iOS. While designing the architecture of the new visualization system, the emphasis was also put on the issue of creating database backups.

Two versions of SCADA systems have been developed for visualization of sewage pumping stations. The first one is dedicated to users having the previous version of the system with more than 40 pumping stations and it has been implemented based on the SCADA system MoVicon version 11.5. The standard for this version is the use of two 28" – 32" monitors working in UHD mode.

Splitting image between the two monitors provides increased efficiency in analyzing the status of monitored pumping stations. By default, the detailed information of the selected object is displayed on the left monitor, while the right display shows a map with all selected objects and their status. The right screen is also dedicated to independent analysis of selected parameters, e.g. charts of recorded physical quantities, analysis of working time, number of pump starts, GPRS statistics.





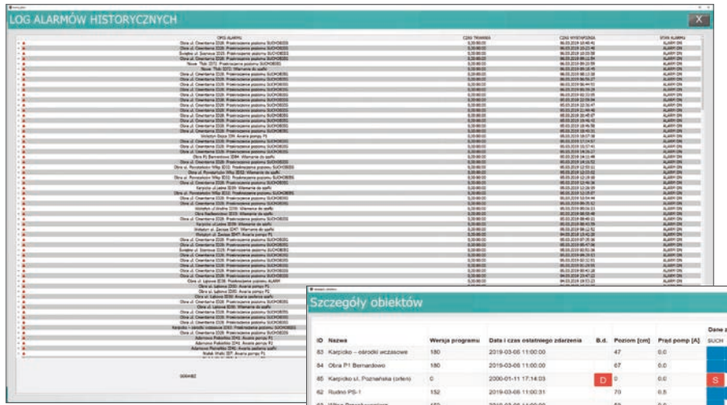
A summary of the most important parameters of monitored objects on one screen is known from the previous version of the system and facilitates quick analysis of the status of objects.

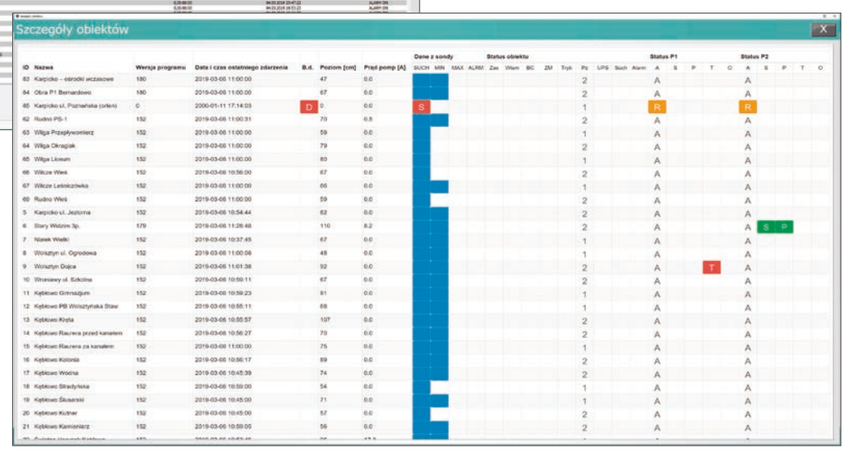
The window of unconfirmed alarms is active in the right corner of the screen. The alarm module has been significantly expanded and enables advanced analyzes of historical alarms.

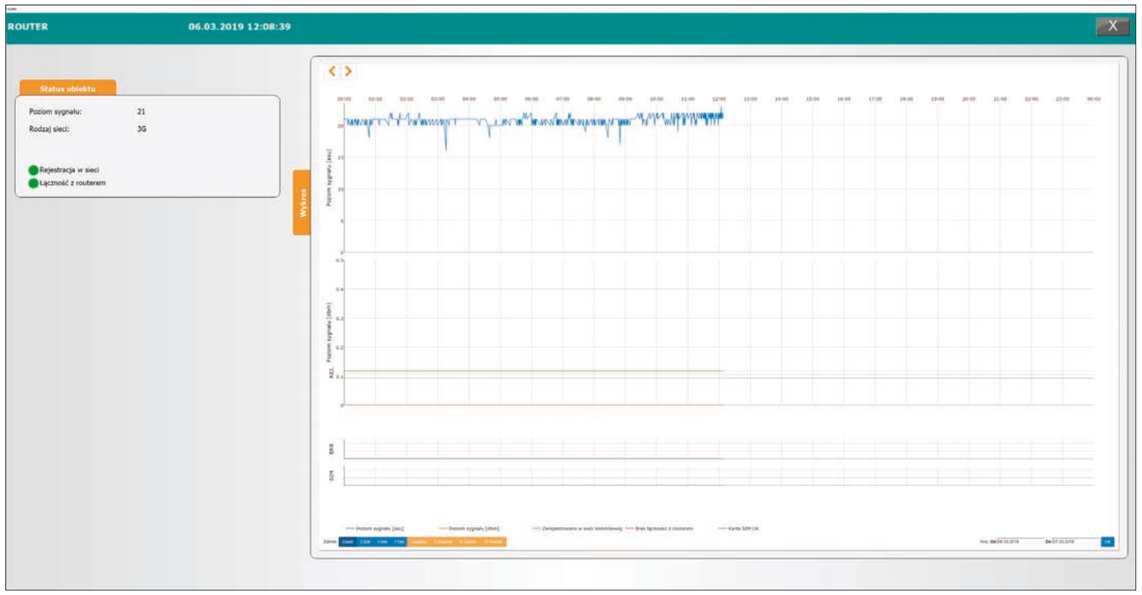
In the newest version of the system, there is also a window with details of objects, known from the previous version.

In order to ensure the highest possible reliability of operation of the visualization system, the critical parameters of the TK525 router are checked on an ongoing basis. On the top bar of the window, the status of the router and the signal level are presented. Detailed information is also available on a graph of the received 3G network signal level.

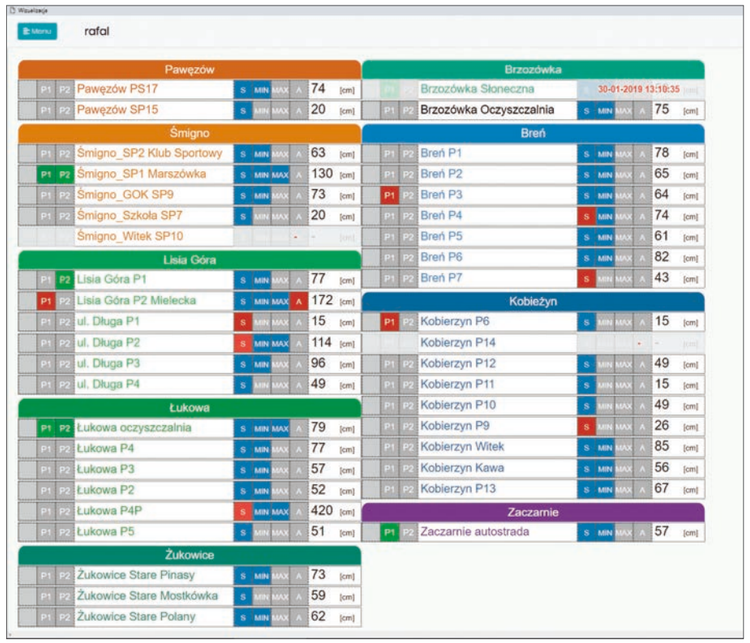
The second version of the system was created for users with fewer objects. It is based on a visualization system created by our team from scratch.



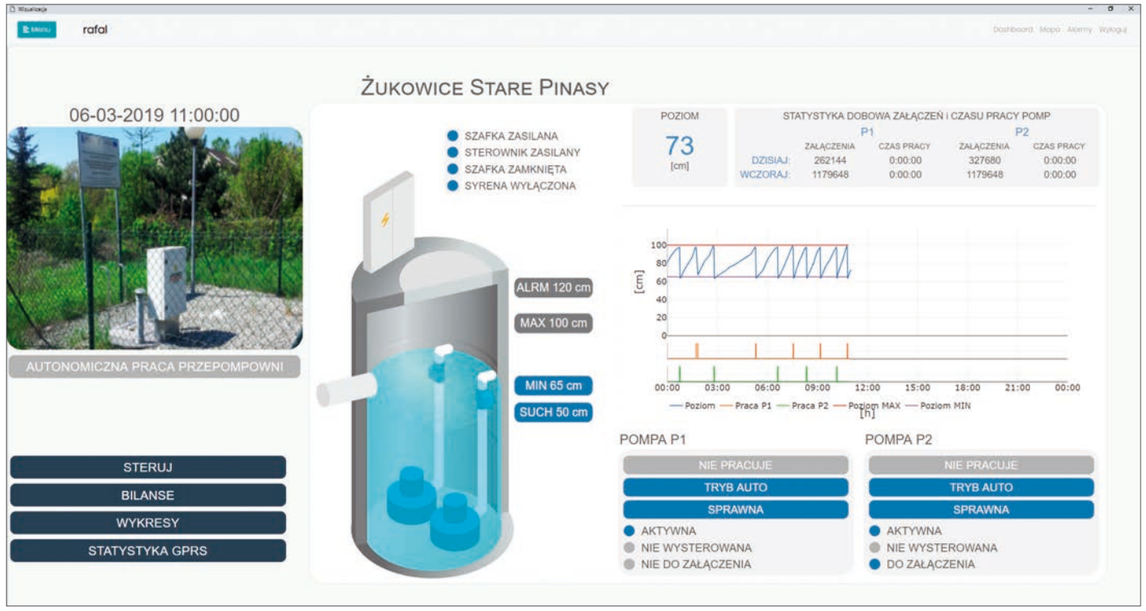




The fully scalable graphical interface and responsiveness of the page allow you to run applications on monitors with resolution lower than WQHD or UHD. It is possible to easily configure the user's router and thus gain access to data from anywhere using a computer with WINDOWS 10 or mobile devices.

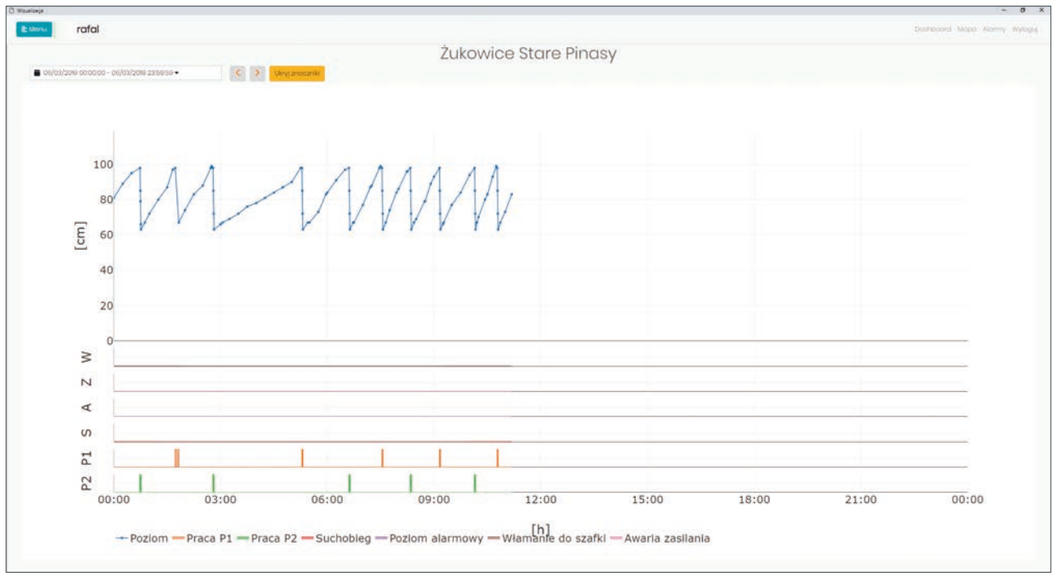


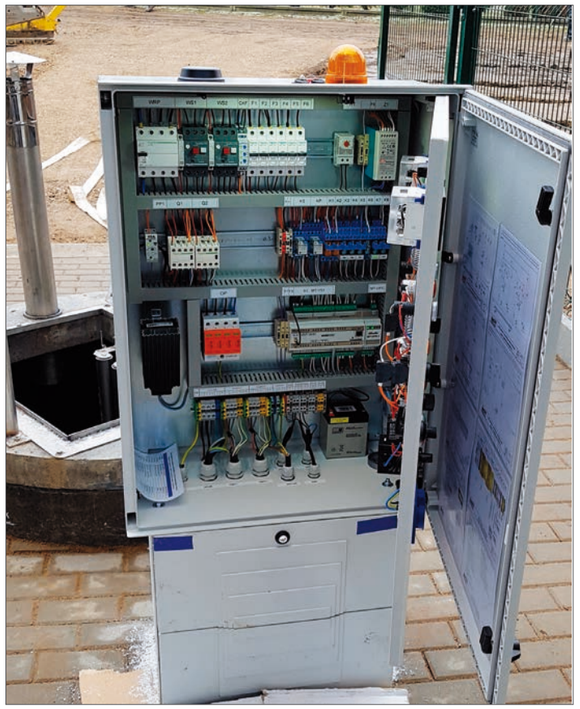
The use of the so-called dashboard allows quick and effective supervision of pumping stations.



An intuitive interface presenting the status of the monitored pumping station was created in accordance with the latest trends. The screen with charts combines modern design with the functionality known from the previous version of the system.

Striving consistently to ensure the highest possible level of offered solutions for sewage pumping stations both in the SCADA system layer and on the object level, our programmers also made significant modifications in the application software for the MT-151 LED V2 module for controlling the sewage pumping stations.

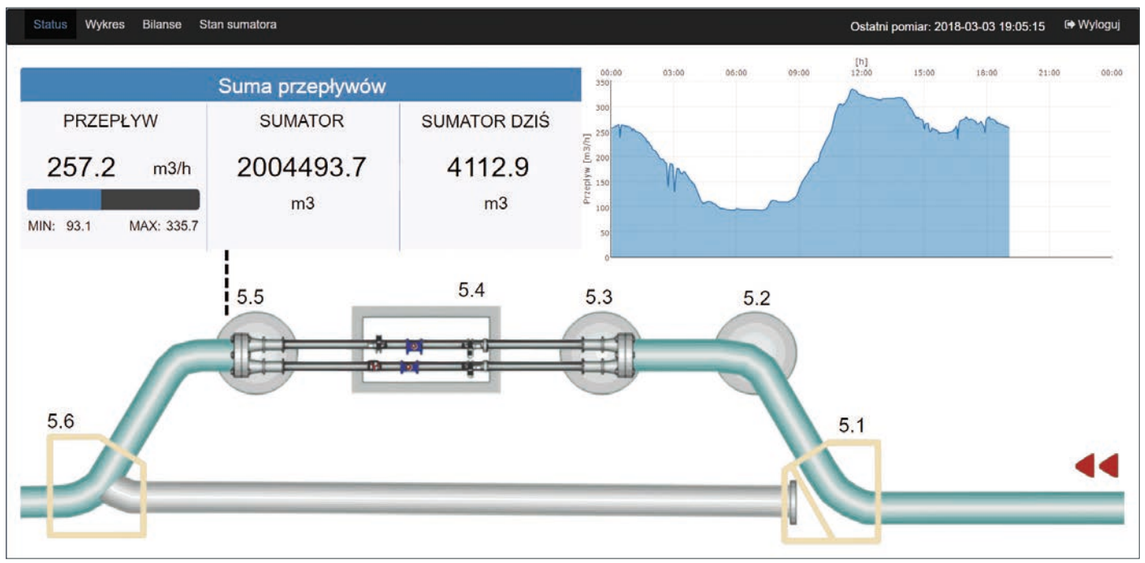


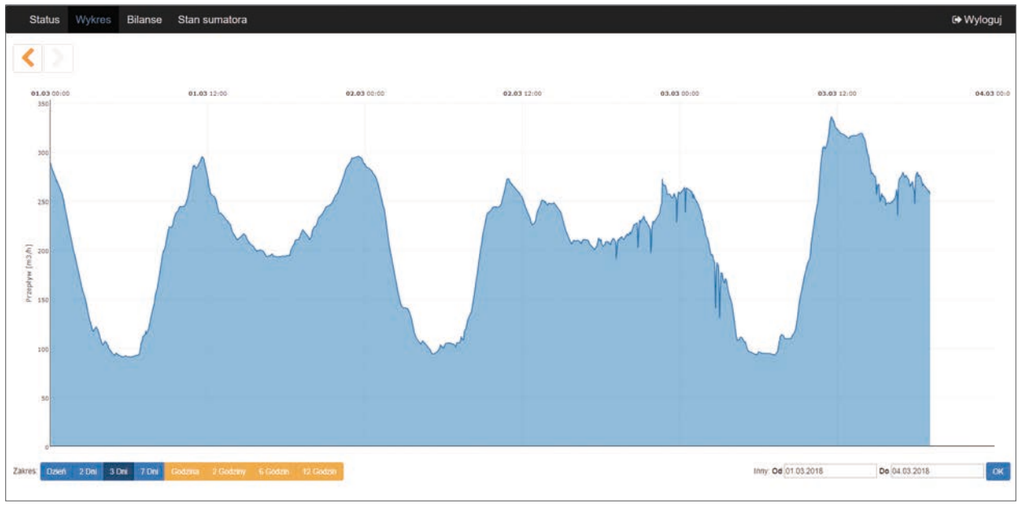


The software has been extended with further diagnostic functions, which accelerate the remote analysis of the pumping station operation from the level of the SCADA system, and allow to precisely determine which pumping station control element works improperly or has been permanently damaged. An example of a control cabinet equipped with the MT-151 LED V2 module and MT-UPS-01 module is presented on the photo.

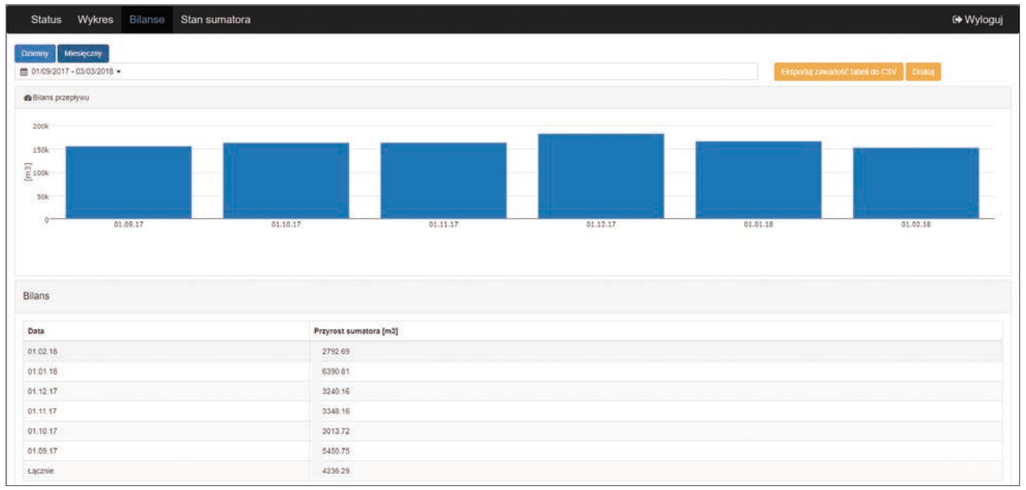
Measurement of sewage flows between municipalities and from industrial plants for financial settlement purposes using dedicated electromagnetic flowmeters + modern cloud solution for visualization with access to data from a web browser

In 2018, our team consistently developed a new generation of the cloud application to visualize the measurement processes on distributed objects, based on access to data from a web browser. Full scalability and responsiveness of the site have been ensured by using vector graphics in SVG format, as well as the Bootstrap library. Due to this solution, the content of the page adapts to the size of the screen on which it is displayed. The capabilities of JavaScript, HTML5, and CSS3 were also used. Below is an example of visualization of sewage flow in a solution intended strictly for billing purposes, i.e. settling receivables for the transfer of wastewater to a sewage collector connecting two municipalities.





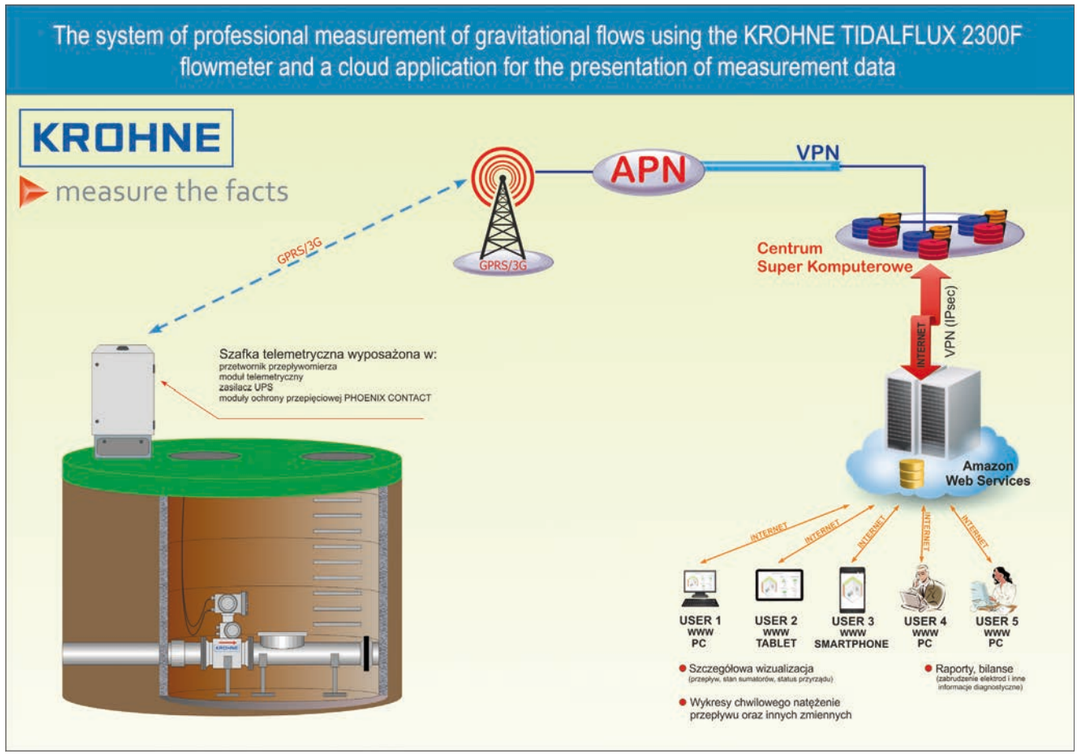
Na rzutach wykresy przepływu oraz bilanse.



Responding to market needs, in 2018 the metering process of gravitational sewage discharge from industrial plants was continued based on a professional flowmeter TIDALFLUX 2300PF made by German company Krohne, using the newest measurement techniques.

The measuring system includes, of course, telemetry set with a cloud application for the visualization of the measurement process and a billing module. Below is a block diagram of a complete, professional system for metering of gravity wastewater flows. The system consists of a measuring chamber with a specialized flowmeter TIDALFLUX 2300PF, a dedicated measurement and telemetry cabinet containing, among others, MT-101 telemetry module and a modern cloud application for the visualization of the measurements with chart modules

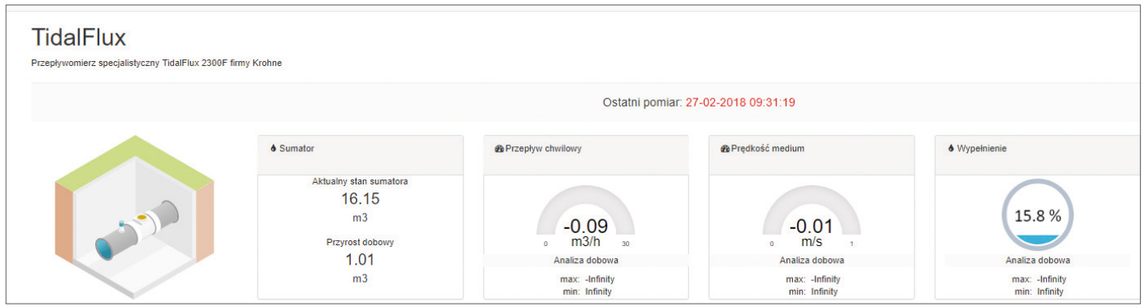
and for calculating balances. Communication between the flowmeter and the MT-101 module is based on the ModBus RTU protocol.



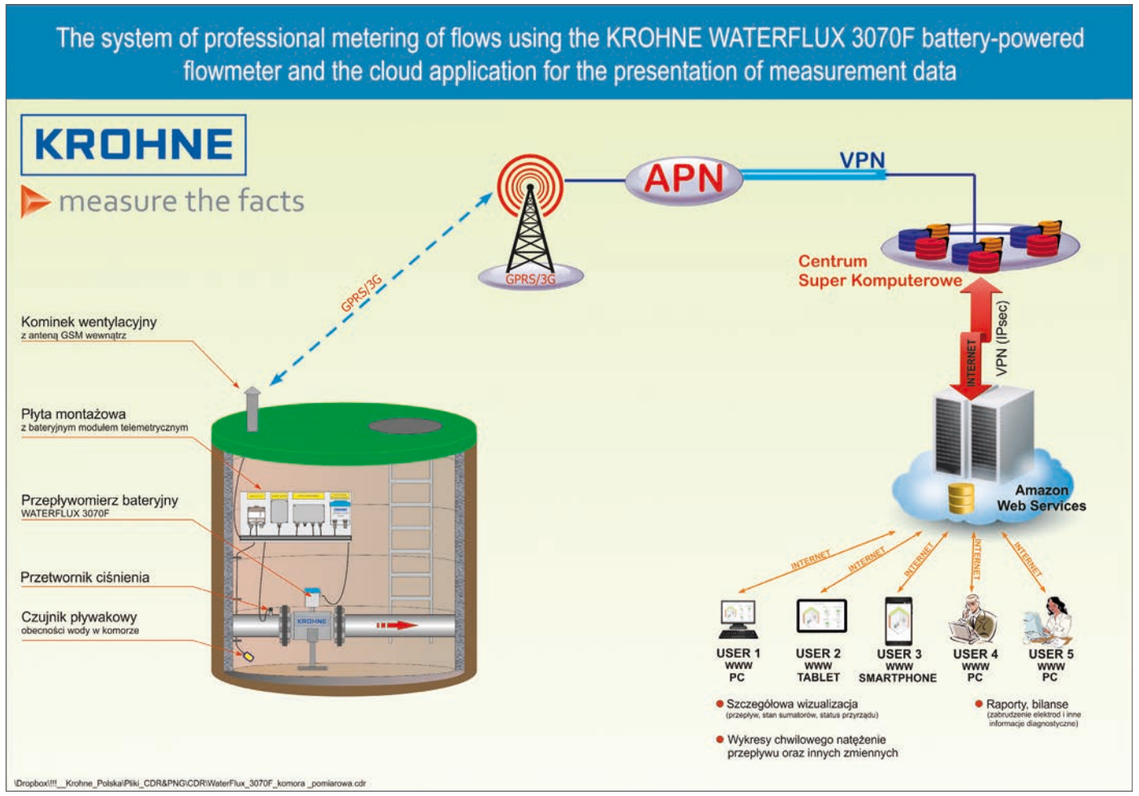
On the screenshot fragment, the cloud visualization dedicated to the TIDALFLUX 2300F flowmeter is shown. In the right part of the window, there is an additional field informing about the level of sensor filling.

Telemetry modules MT-331, MT-713, MT-723 in applications for monitoring flows and pressures on treated water chambers. Measurement points powered from batteries, accumulators or renewable energy sources + modern cloud solution for visualization with access to data from a web browser

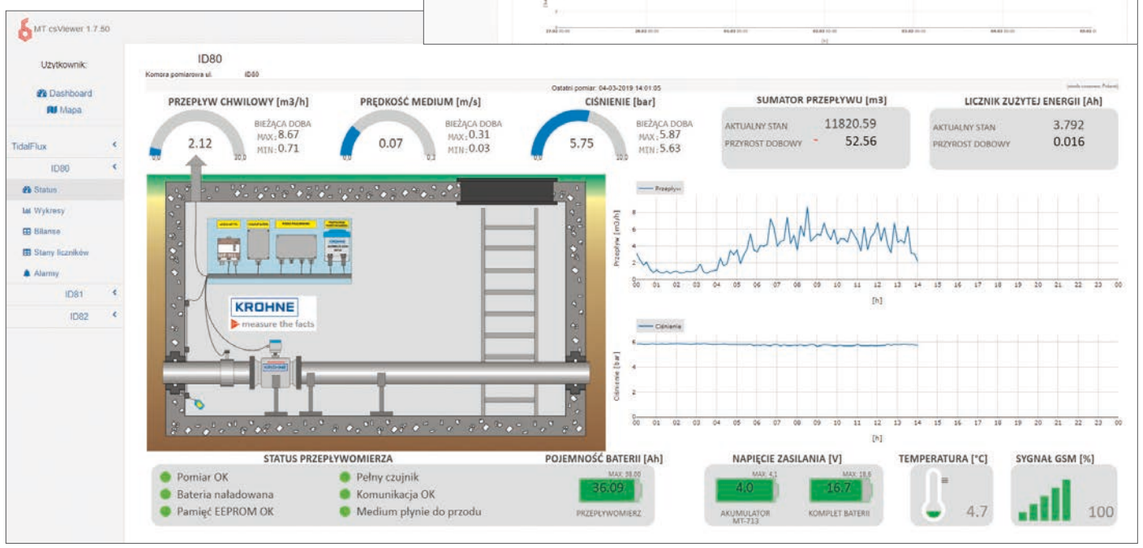
In 2018, further tasks related to the metering of flows and pressures on the clean water mains were carried out. Since the mains-powered measuring chambers do not pose a technical challenge, in this article we describe the points on which there is no 230 V supply available, due to the distance from LV power lines. The use of battery-powered telemetry modules and measuring devices were required with accumulators or renewable energy sources.

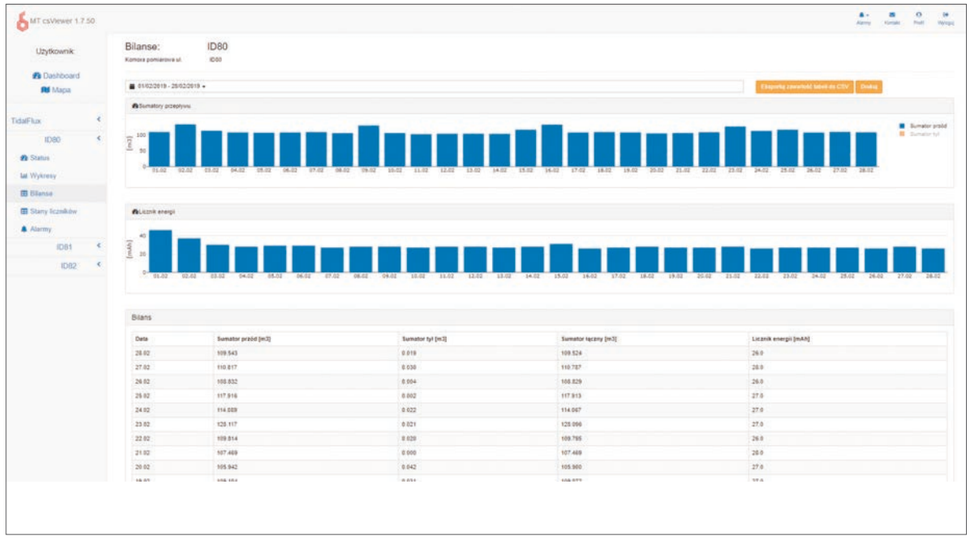


In the professional solution presented above, a modern, specialized Krohne WATERFLUX 3070F electromagnetic flowmeter and a telemetry module MT-713 in a special version, i.e. powered from an external battery pack, and equipped with an RS-485 digital communication port with ModBus RTU protocol support were used. The possibility of digital communication between the WATERFLUX 3070F flowmeter and the MT-713 module allows for sending much more critical measurement and self-diagnostic information to the visualization system than in the case of simple solutions based only on the transfer of information via pulse and alarm outputs. In the case of battery-powered flowmeters, it is important to adjust the speed of measurements to the dynamics of the flow of the measured medium. The implemented solution ensures obtaining an optimal ratio between the effective accuracy of the measurement system and battery life. The logger embedded in MT-713 module allows for accurate mapping of current values of flow and pressure in the visualization system. In order to facilitate assembly in the chamber, the telemetry system components have been mounted on a special board. The applied solution significantly accelerates the commissioning of the entire measurement system and possible diagnostics.



To visualize the measurements process is used the same cloud application, as to serve the chambers with flowmeters for measuring sewage flows. The structure of elements displayed on the website is adjusted to the standard of the measuring chamber's equipment. In the case of battery-powered flowmeters, it is important to control the energy consumption of individual devices and to estimate the time remaining for battery replacement in the telemetry module or flowmeter.

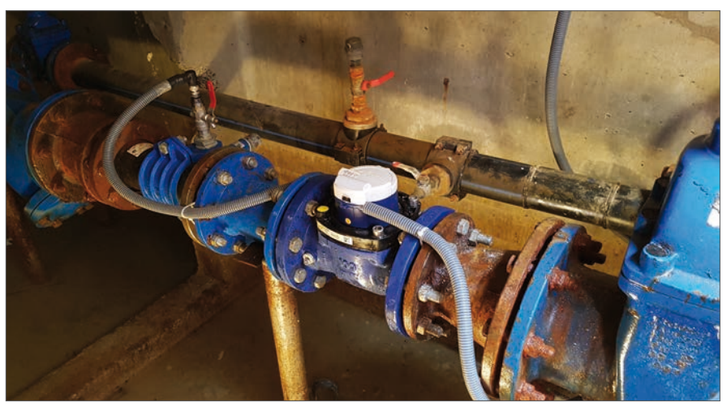




Intuitive charts facilitate quick analysis of recorded quantities.

In 2018, more measuring chambers equipped with classic water meters were also included in the system. Depending on the type of the object, telemetry cabinets were installed outside or inside buildings. Control of the flows and pressures at various points in the network is particularly important in mountain areas and uplands. Increasing expectations of residents to have the guaranteed pressure, especially at the ends of the network, enforce monitoring of these parameters 24 hours a day, even in the points without mains power.

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



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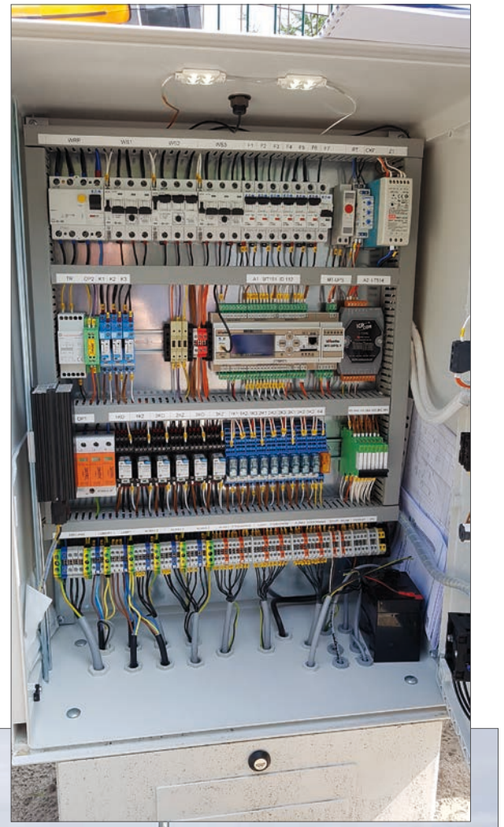
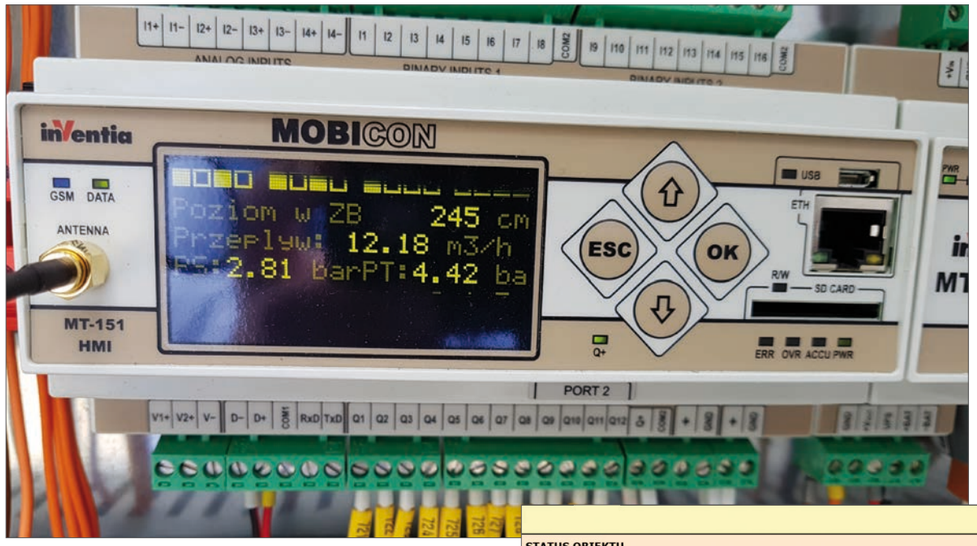
Monitoring of hydrophore sets equipped with own PLC controllers using the MT-151 HMI telemetry module

Migration of inhabitants out of cities forces the expansion of the existing water supply network. It is not always possible and reasonable to increase the cross-section of the transfer pipes to meet the growing demand for water. The segmentation of treated water networks, the construction of buffer tanks and chambers equipped with hydrophore sets is in many cases the only solution. An indispensable element in such installations is a remote monitoring system that controls the water level in tanks, the work of the hydrophore unit, flows and pressures, the work of the aggregate, switching on the area lighting lamps, or zone violation.

Signals from the ZH controller, aggregate controller, flow meter, or pressure and level transducers were fed into the telemetry cabinet in which the MT-151 HMI module was installed.

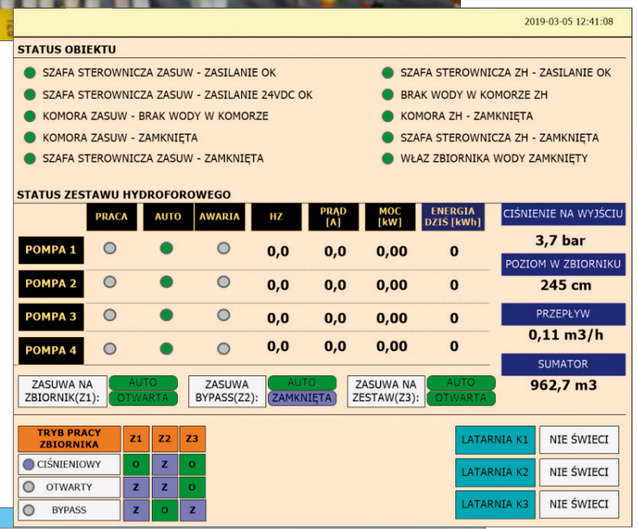


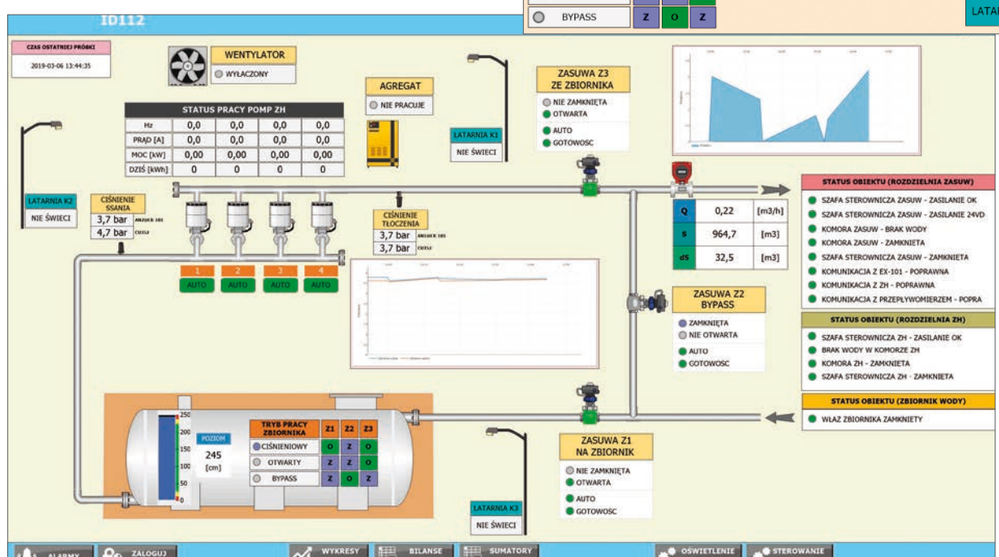


The ability to define screens on the graphical display allows local verification of the value of over 30 parameters.

Full visualization of the entire facility has been performed in the SCADA MoVicon system.

Below is a screenshot of the detailed visualization of this object.





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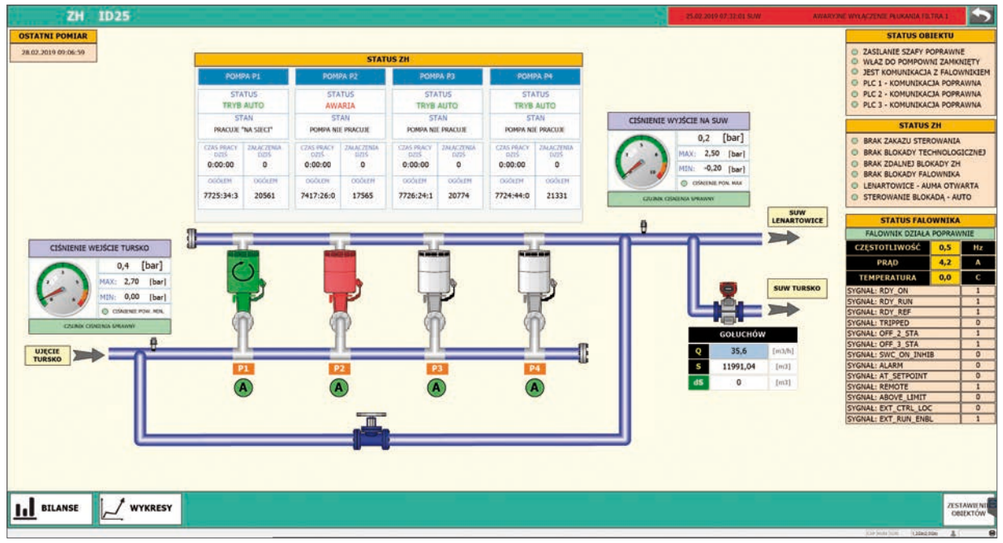
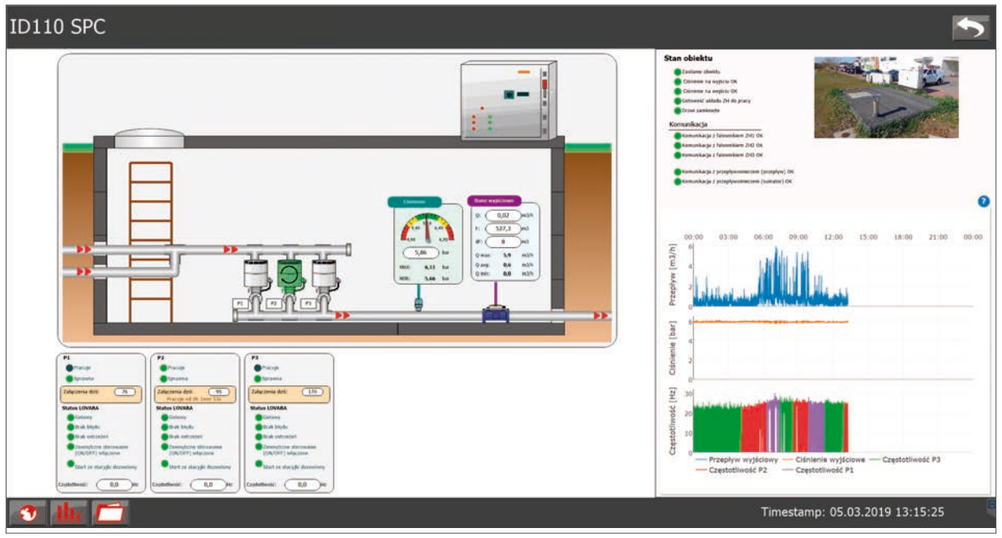
Another object is a hydrophore set controlled by the SIEMENS controller. The MT-151 module reads data from the controller registers and sends them in 3G mode to the dispatching station where the MoVicon SCADA system is installed.

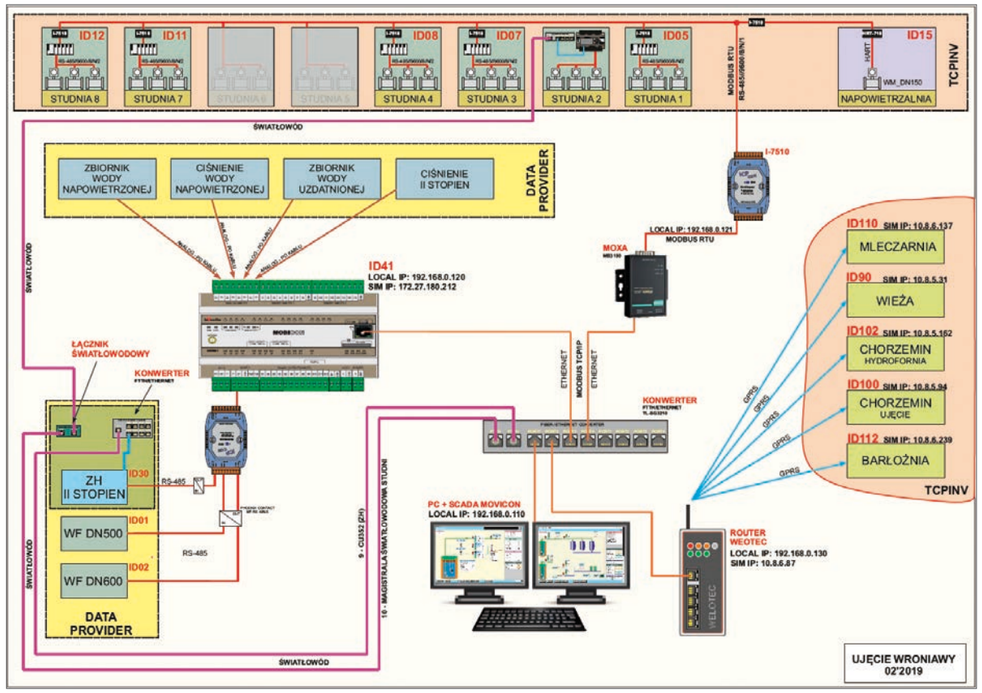


Below is a screenshot of the next object of ZH type. Visualization is made in the SCADA MoVicon system.

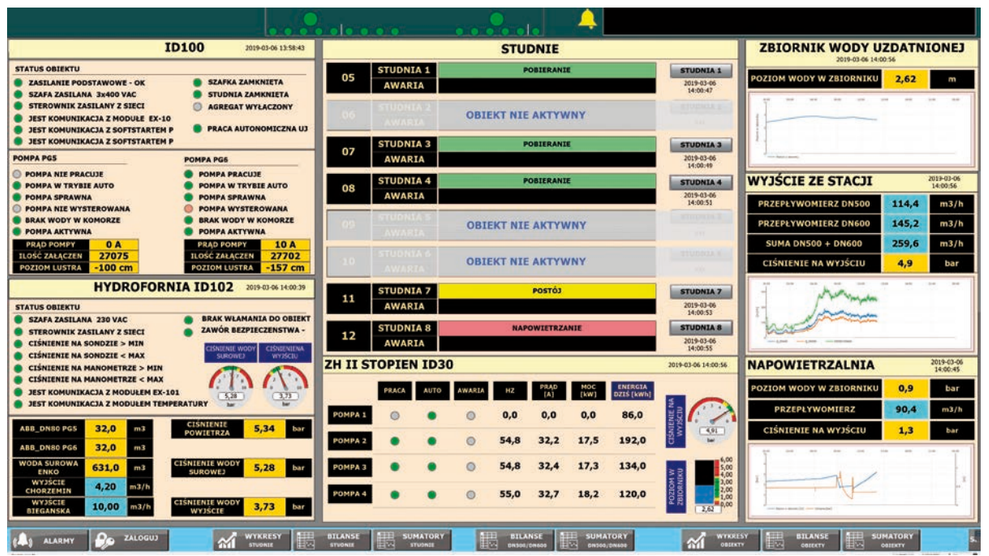


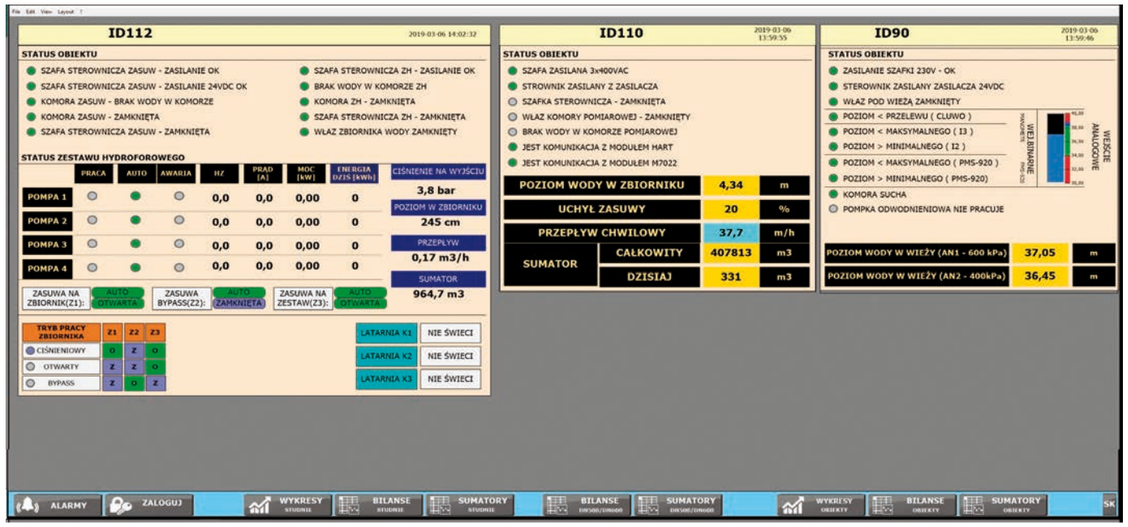
Monitoring of advanced water treatment stations based on the PROGEA MoVicon SCADA system

In 2018, the process of implementing the visualization systems based on the MoVicon SCADA was continued. It enabled the simultaneous reading of data from objects connected to the local industrial Ethernet network and reading data from the WELOTEC router sending data from distributed objects. Because of the distances between objects, a fiber-optic bus connects the controllers with each other.



Below is the visualization of this system. Due to the number of objects and drivers, the visualization made in the MoVicon SCADA system is displayed on 2 UHD monitors.

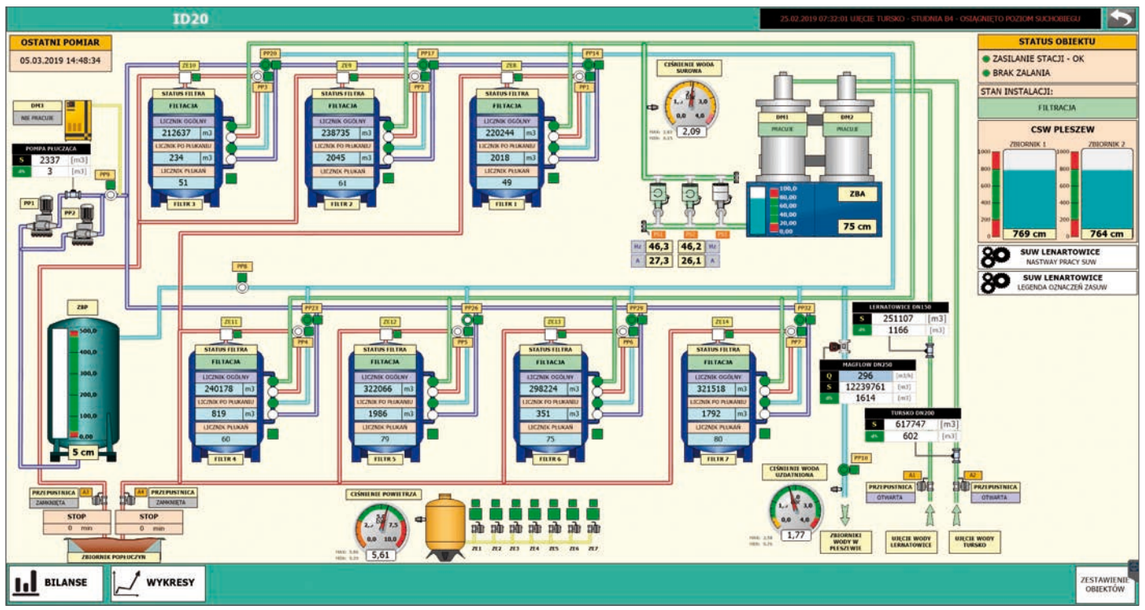




On screenshots below, the next visualization of the water treatment station is presented.

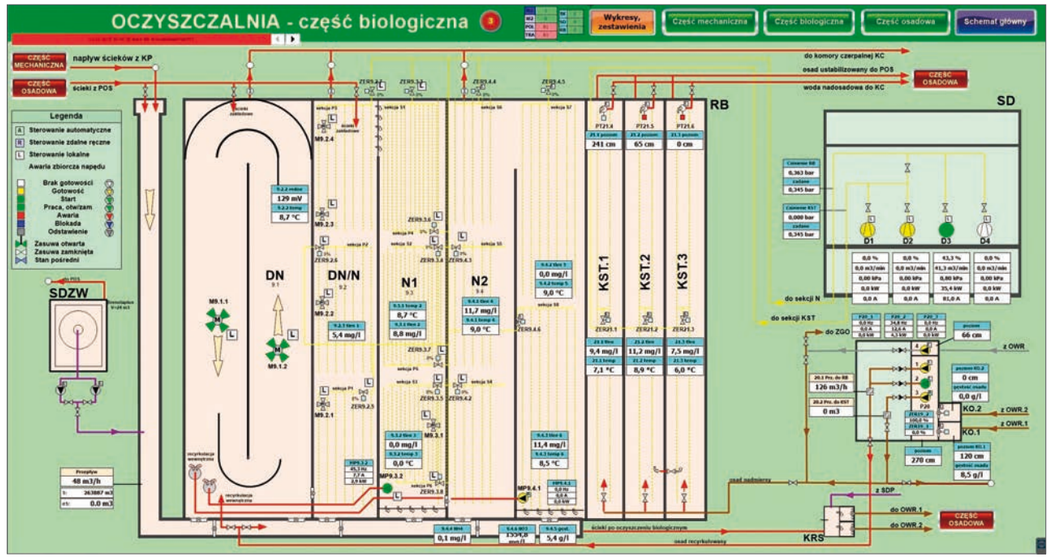
Below is an example of a modern visualization application made in the SCADA MoVicon system. It is a technologically advanced water treatment station. The data from the PLC controller, which is responsible for the process control, is transferred to the dispatch station.

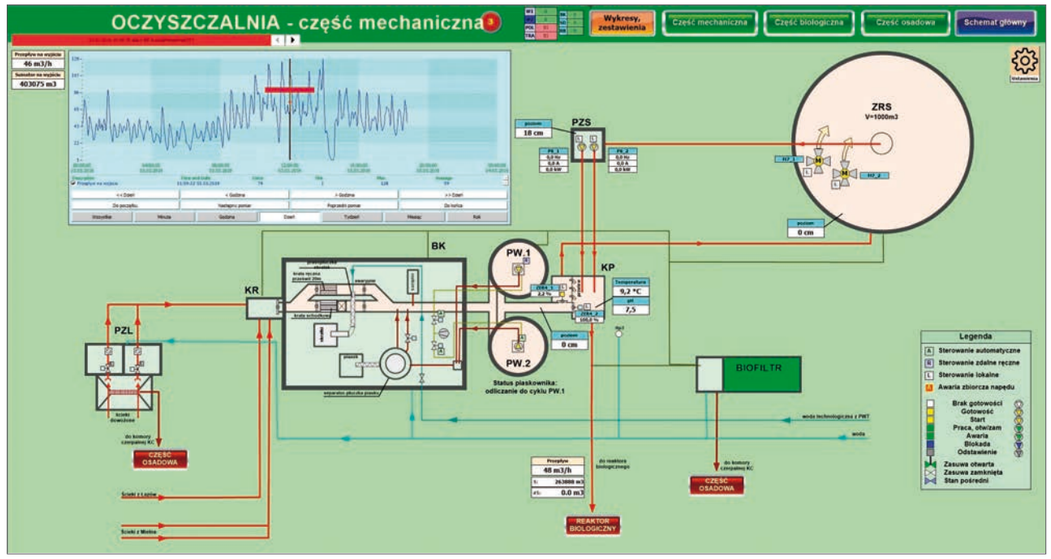
To sum up, the features offered by the MoVicon SCADA system allow creating professional and modern applications for visualization and remote control of selected functions of the technological process.



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

In 2018, visualization systems for sewage treatment plants were developed in the Movicon visualization system, which is distributed by the AB-MICRO company.

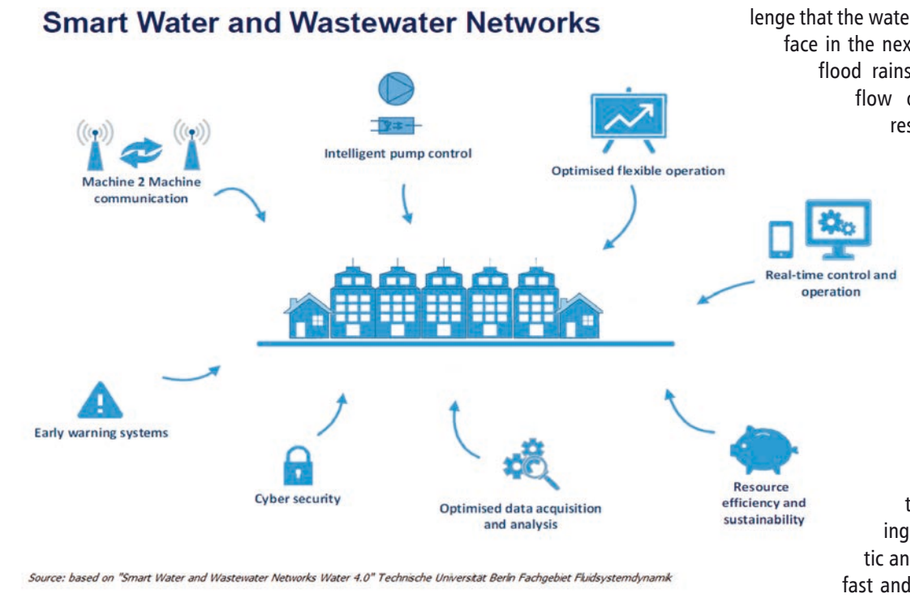




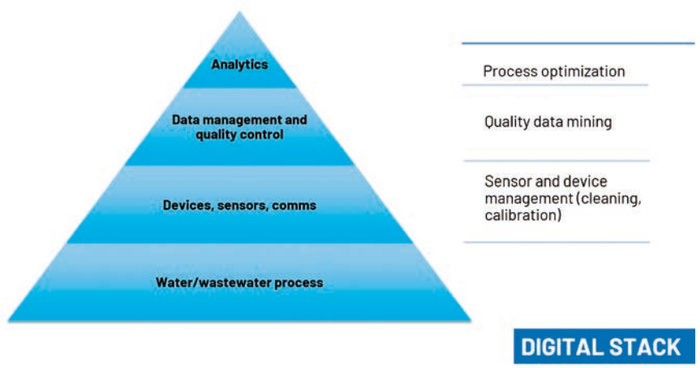
Summary and briefly about the idea of SMART WATER

The MT-151 LED/HMI V2 module enables complete implementation of the control process for small water treatment plants or sewage treatment plants. The ETHERNET port enables creating local subnets and communication with inverters, flow meters or gate valves. Data transfer to the router located at the control station uses 3G technology. The technical capabilities offered by battery-powered telemetric modules com-

bined with the accuracy of the measuring devices mounted at the control points allow for more and more accurate control of the parameters of the treated water network, leak detection or loss calculation. In conjunction with professional visualization, made in the SCADA MoVicon system, our team aims to offer solutions that are compatible with the „SMART WATER and WASTEWATER NETWORKS" concept, which is part of the WATER 4.0 philosophy.



Source: based on "Smart Water and Wastewater Networks Water 4.0" Technische Universität Berlin Fachgebiet Fluidsystemdynamik



The implementation of the „SMART WATER and WASTEWATER NETWORKS" concept is another challenge that the water and sewage industry must face in the next decade. Climate changes, flood rains, the need to control the flow of rainwater to retention reservoirs to avoid flooding, minimizing water losses, increasing the safety of the of treated water networks, optimizing the maintenance of water networks according to the „predictive maintenance" principle, are the factors that force the use of an increasing number of control and measurement devices in the network. A condition for the proper functioning of such a complex diagnostic and measurement structure is fast and reliable data transmission between control points, and a computation center, in which collected measurement data are gathered and processed and then the decisions regarding required control processes are taken.

Professional telemetric modules offered by InVentia, in conjunction with professional control and measurement devices from other manufacturers, enable practical implementation of systems compatible with the idea of SMART WATER and WASTEWATER NETWORKS. The promotion and practical implementation of this idea is a challenge for the next years that is standing in front of our team.

ControlSystem
Profesjonalne systemy telemetrii GPRS

Remote monitoring of installations for water filtration **using MT-151**

Hernán Canales N. – Proyex, Chile

Our partner from South America, the Proyex company (Chile), developed a solution combining Ethernet communication (network infrastructure based on the classic cable and WiFi radio) with the industrial MODBUS protocol and GPRS/3G communication to send information to its own computing cloud. He provided the system users with the presentation of process data while maintaining the possibility of remote modification of work parameters.

The increase in the importance of awareness of environment protection, the rational use of natural resources and the sustainable production of goods and services is observed in the world. IIoT technologies are the basic tools for better use of natural resources, greater efficiency of production processes and, first of all, early detection of emergency situations.

Having solid and reliable technologies is crucial for developing the success of each company's sustainability projects. Sensors, control devices, data transmission systems, information storage, visualization systems, and analytical applications must be robust and reliable enough to ensure the success of any project.

The reliability and potential of the MT-151 telemetry module allow for developing the monitoring and control solutions using various architectures and communication protocols.

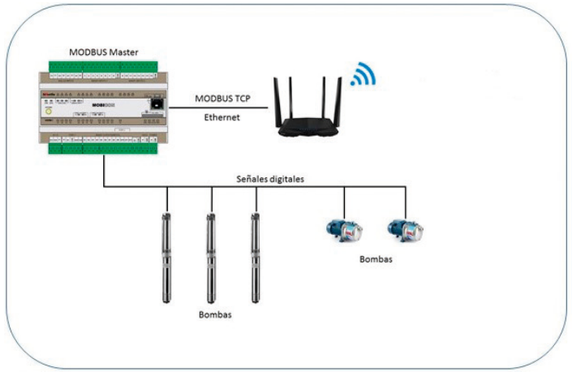
OUR PARTNERS

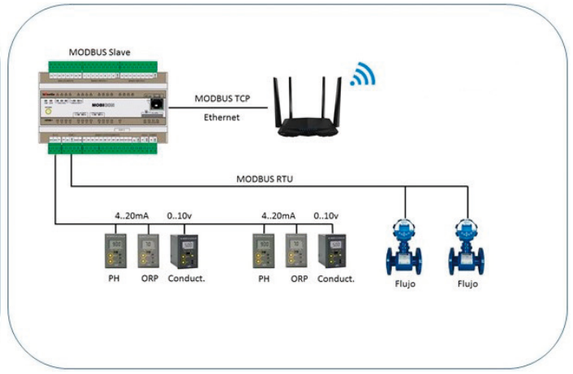
Biofiltro, the client of our Partner, is a Chilean company that offers wastewater filtration services using 100% natural physical and biological methods. The filtration system developed by Biofiltro has been implemented using methods that allow the cultivation of biomass rich in bacteria and earthworms responsible for the biological filtration of water.

Thanks to the extensive structure of the control panels and sensors, Biofiltro remotely monitors of system performance and water quality parameters 24 hours a day. The system also allows adjusting its load in order to ensure optimal performance.

Biofiltro inoculates a specific mixture of earthworms and bacteria in order to achieve maximum efficiency in the reduction of such parameters as biochemical oxygen demand (BOD), total suspended solids content (TSS): fats and oils and nitrogen, total dissolved solids (TSD) content: ammonia and phosphorus. Earthworms form air ducts, digesting solid suspensions. They can reach a density of up to 12,000 earthworms per square meter.

A reliable and robust monitoring and control system was required to inject the right amount of water into the biomass and to predict whether water conditions would not be harmful to earthworms and bacteria responsible for filtering. The priority was to detect and effectively correct critical situations by adjusting the operating parameters of the entire system. For this purpose, Proyex has developed a water quality monitoring system, irrigation automation, water level control and support for impulse water pumps based on InVentia MT-151 telemetry modules. One of the most important points of this process is the protection of biomass, consisting mainly of earthworms by:

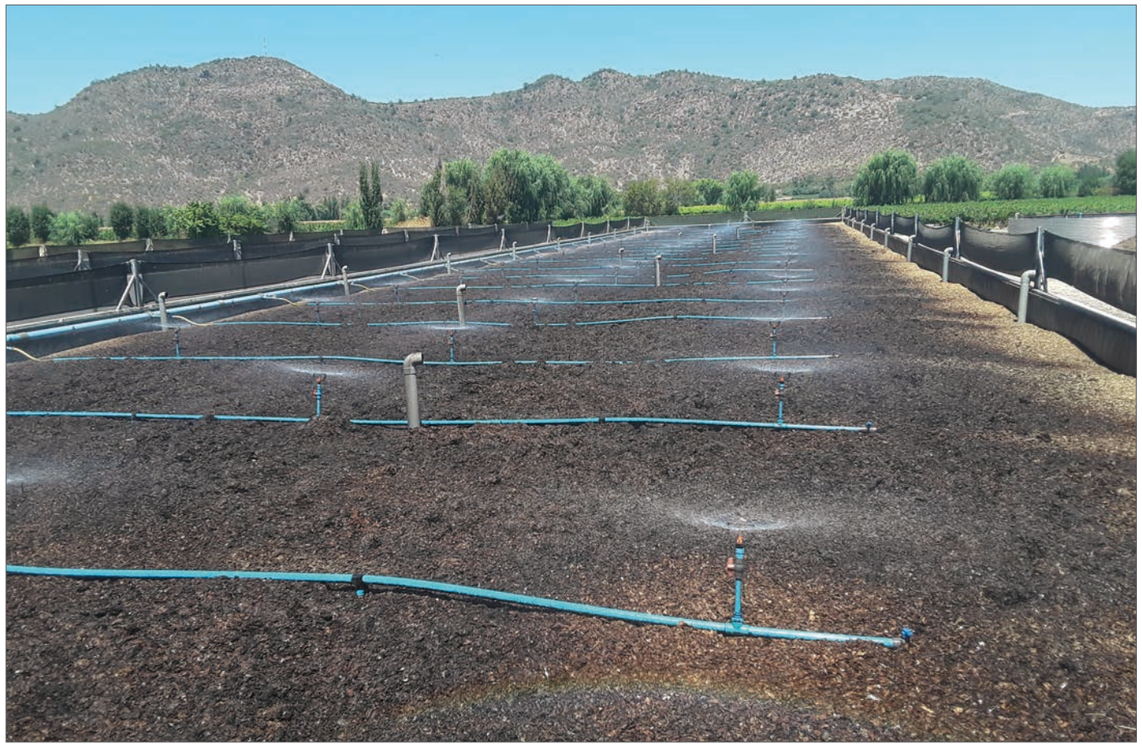




- A permanent monitoring of the parameters and wastewater availability, which are to be used for the filtration process
- Monitoring of pH, biomass conductivity and ORP water coefficient before the filtration process
- Dosing the right quantity of water into the system and providing adequate rest time by the biomass
- Maintaining constant and reliable communication between the monitoring point of the water parameters to be filtered and the water pumping point
- Transferring information to the computing cloud in order to provide the client with remote access to the process from any device with Internet access
- Alerting about critical situations, such as power outages, low water levels, problems with the activity of pumps or indication of the pH level outside the normal range.

Proyex, taking into account previous experience gained in previous monitoring and control projects via WiFi using MT-151 equipment, decided to implement a solution based on the connection of these modules with each other via a WiFi network. WiFi was only used to ensure MODBUS communication between the pumping station (MT-151 Master) and the control center (MT-151 Slave), which are located at a distance of about 50 meters. The devices located in the pumping station (master) obtained water parameters in the form of pH, conductivity, ORP and water level read locally by the MT-151 Slave unit. The internal control algorithm of the telemetry module provided control over the irrigation time, pump sequencing and rest time required by the biomass to maintain the highest efficiency. In addition, if the pH reads are not within the normal ranges, the watering process stops and the facility staff receives appropriate alarm notifications.

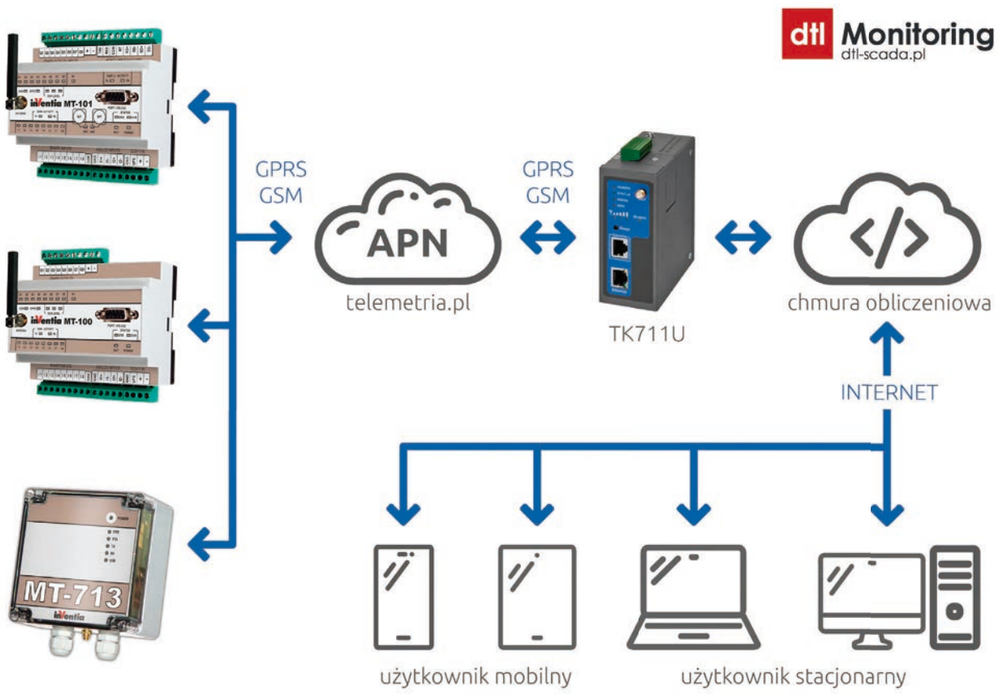
In addition, the central station in the form of the MT-151 module (Master), using the built-in GPRS/3G modem, sends minute by minute information about the system status to the Proyex Cloud www.cloudiot.cl. In this way, both Biofiltro and its customers can continuously from anywhere with access to the Internet, monitor the condition of the filter system, current levels and the amount of filtrated water, and effectively identify and respond to anomalies, such as pump failures, power supply cuts or incorrect indication of water coefficients.



OUR PARTNERS

Implementation of **DTL Monitoring** for Municipal Services Department in Baborów

Bartosz Lichtarowicz – DATALAND Sp. z o.o., Poland



At the beginning of 2018 Dataland Ltd. had set a new task, the aim of which was to develop a telemetry system for water supply infrastructure located in three communes. After three months, the pilot project was implemented in the water treatment station Sucha Psina. It was the first monitored facility and this was the beginning of the new DTL Monitoring project.

The company Dataland Ltd. has been a software producer for many years, with particular reference on solutions based on mobile applications. Yes, and they did it again this time. We wanted to create a system that will notify the technical infrastructure staff as soon as possible about the event of failure or anomalies in the work of the facilities covered by the monitoring. Currently, solutions based on the operation of mobile applications and data storage in the cloud is the part of a fast-growing segment of the IT market. DTL Monitoring is an IT system designed for the supervision, control, and acquisition of data from technical facilities. The user of the system has access to data from the level of a dedicated application for mobile devices (smartphone, tablet) and a web browser via the website.

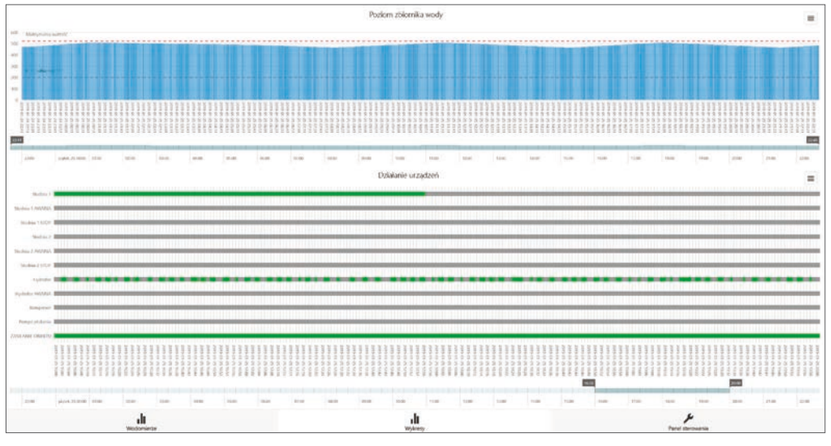
The scope of the DTL Monitoring system includes:

- Displaying current telemetry data from technical facilities,
- Access to archived data and their processing for analytical purposes,
- Notification system for selected changes in a specific technological process,
- Alert system for notifying about emergency conditions of operating devices that may lead to disruption or interruption of the technological process,
- Application of automatic procedures to inform about discrepancies in the parameters of monitored processes (trend analysis),
- Automatic generation of reports within the set time periods regarding the balance of a given facility,
- Remote control of devices.

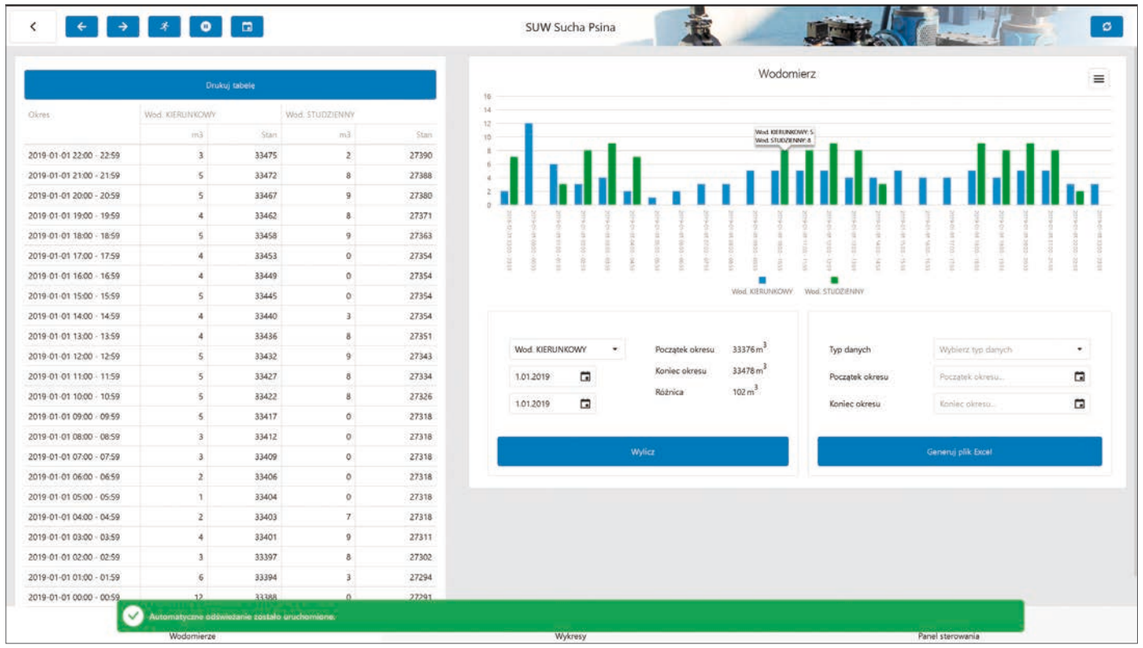
regardless the time of day or where they are at a given moment. This does not mean, however, that we give up a typical computer monitor screen for a dispatcher or a manager of a given infrastructure, which is an essential element of any SCADA system. We, however, give it a more analytical than operational character, which in the case of water supply systems seems to be justified.

Why did we choose a solution based on a mobile application?

It is hard to disagree that nowadays most of us almost do not part with their smartphone. We are available on-line practically 24 hours a day, we search for desired information on the web and share our content with others. The use of mobile technology in relation to the process of monitoring technical facilities is an undoubted advantage for the service staff who needs to be quickly notified about the failure

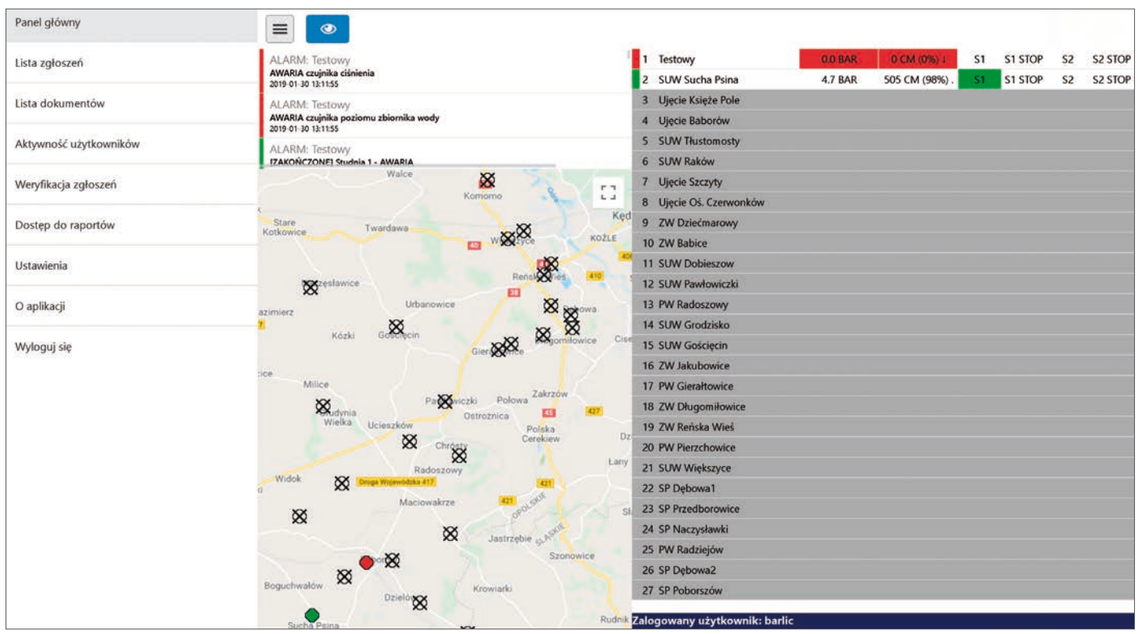


OUR PARTNERS



A small company can also have telemetry!

„Telemetry is expensive and only large plants can afford it." Such an opinion can often be heard in smaller waterworks that manage the network in a small municipality somewhere in the province. Our implementation shows that it does not have to be that way! Together with the board of ZUK Baborów, we managed to design an advanced telemetry system optimally suited to the user's needs, develop a financing plan, provide the necessary equipment and finally run a system based on modern information technologies.



We started the construction of the entire telemetry system at the beginning of 2019. The first stage of implementation includes 26 important points of water supply infrastructure distributed across three communes administered by ZUK Baborów. These are mainly water intakes, water treatment stations, drinking water retention reservoirs and measuring wells on the main water mains. While selecting telemetry devices that work in the field, we wanted to be sure that these devices would be technologically advanced with high functionality. It was also important to have well-developed documentation, warranty and technical support from the manufacturer. Our cooperation with InVentia has been established here. We bet on a Polish manufacturer with many years of experience in the market. The devices have been optimally selected for the needs of a given point in the water supply network. The MT-101 telemetry modules were installed mainly on larger water supply stations. Their task is to transfer the current station operation parameters and supervise the operation of devices. The possibility of using a large program capacity of the module makes the MT-101 a full-size PLC, which can be used to optimize the station's operation. In the future, this will allow for modernization of station automation devices, where the majority of control functions will be taken over by the InVentia telemetry module. Smaller stations have been equipped with MT-100 modules acting like a typical supervisor monitoring the operation of devices. For the purposes of this implementation, a universal telemetry cabinet has been developed that allows connection of all monitored devices to telemetric modules. We have predicted the space for expanding the system with further modules, e.g. EX-101 or other devices communicating via the serial port with the MT-101 module.

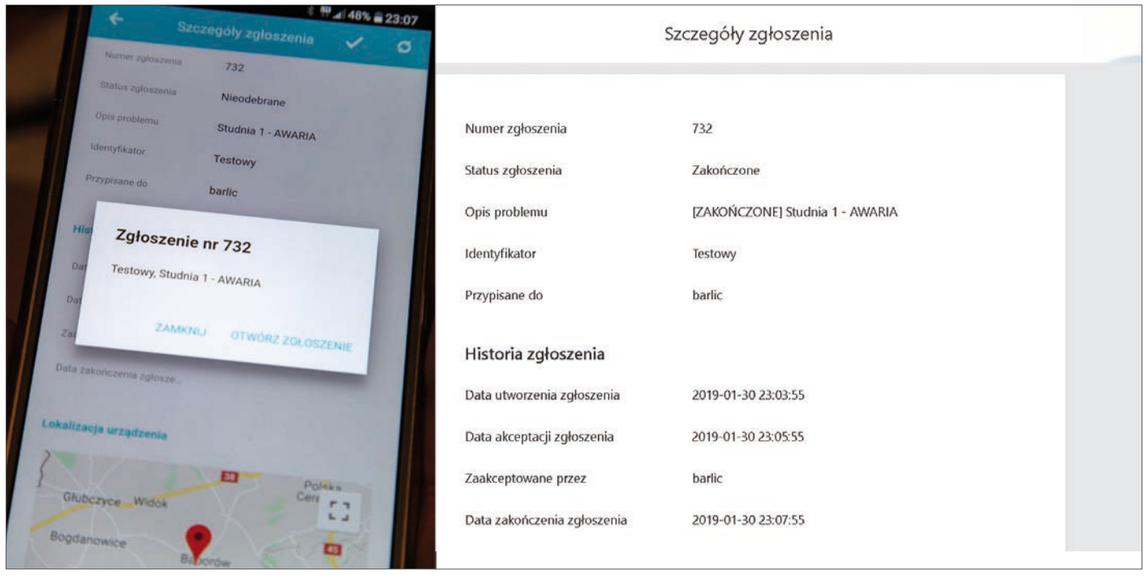
Seventeen telemetry cabinets have been installed at all water supply stations with continuous power supply from the power mains.

Other points covered by the monitoring are the places that required the use of battery-powered modules. In this case, the MT-713v2 HC HV telemetry module was used, which was put into the measuring wells and some retention reservoirs of drinking water. The version of the HC module with an increased battery capacity guarantees longer module life, and the optional HV extension allowed us to adapt to the pressure transducers and hydrostatic probes installed on these objects.

Długomilowice Water Tower – application of MT-713 v2

Hierarchical notification structure

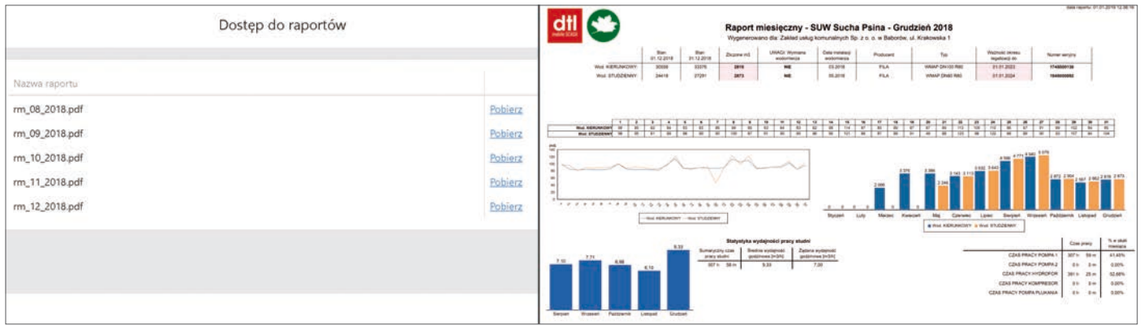
Each user of the DTL Monitoring IT system is identified by a unique username and password assigned to him. Each user has the assigned monitored points and a range of privileges in the system. The system allows sending notifications to all users or to selected groups or individuals. Each alarm generates sending information to the users assigned to it, and the recipient must confirm receiving messages in the application. Event information can be sent to all assigned people in parallel or according to a specific key to individual users of the system. For example, information about an event at a given water treatment station goes first to the maintenance technician responsible for this object. This person, should confirm the received information in the application and take appropriate action in the facility. If at the given time the system does not receive confirmation of message receipt, it will alert the next user, e.g. the water and sewage emergency or the manager. Such a hierarchical notification system transforms into a better organization of work in the company.



Functionality for the explorer

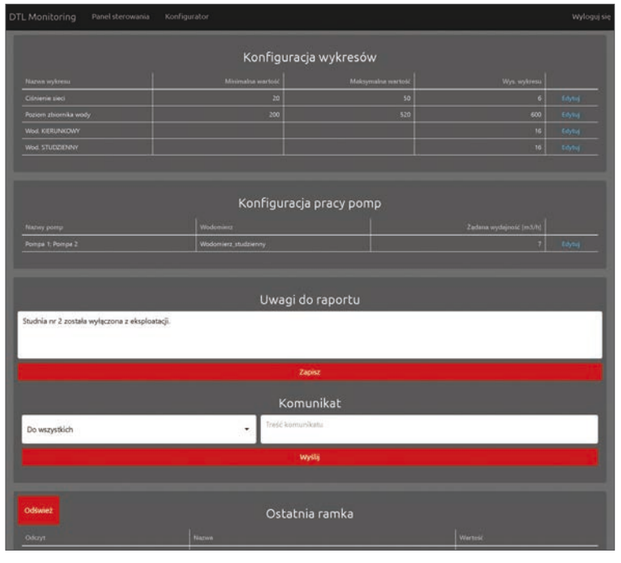
Notifications of emergencies are only part of the tasks that the DTL Monitoring system performs. Wide range of possibilities of analysis and processing of collected data should be of interest to the insightful manager of the water supply infrastructure. The system implemented for ZUK Baborów uses both the potential of InVentia telemetry modules as well as the work with a database. Significant data collected by telemetry modules MT-101 and MT-100 are put off in their internal registers and then sent to the system. This allows you to automatically generate the monthly reports for each monitored point, containing all relevant data relating to the work efficiency of the object.

In addition to the algorithms implemented in telemetry modules, tools for analyzing data retrieved from the database have been created. In this way, for example, night consumption of water is analyzed in a given area of the water mains supply. Such analysis is helpful in quickly detecting leakages on the network. The detected anomaly is signaled by an appropriate notification sent to the dispatcher. Analyzes of water level trends in retention reservoirs help in assessing the efficiency of deep-well pumps. The user can download specific data to a spreadsheet, where he can analyze it in any way. Another feature of the DTL Monitoring system is the control panel. The user having access to it, after logging in, has the possibility of remote control of devices connected to telemetry modules on monitored facilities. We can, for example, switch off a given deep-well pump or change the setting of the gate valves with an electric drive. The use of remote control capabilities of InVentia telemetry modules allows you to significantly reduce the travel costs of service personnel to a given water supply facility.

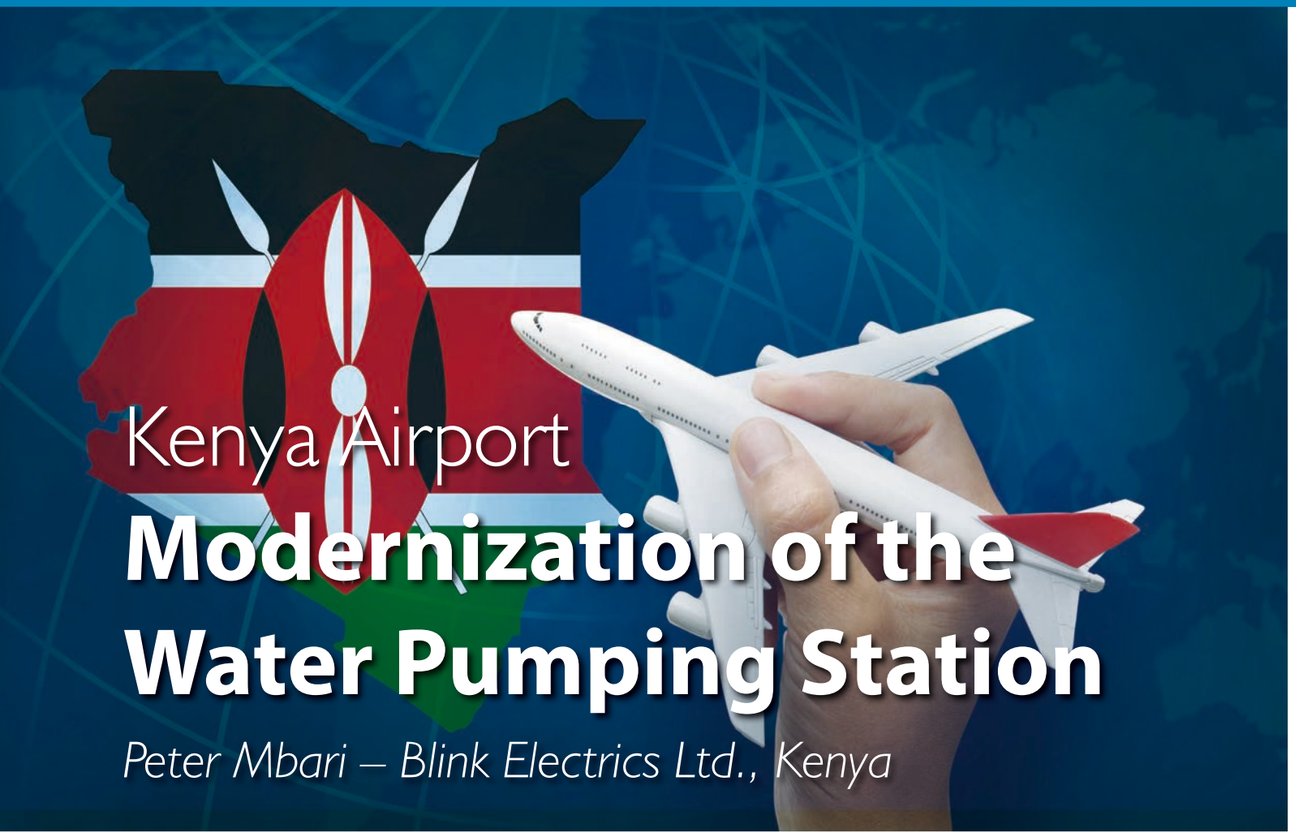


Next stages of implementation

The great functionality of InVentia telemetry modules allows for extensive expansion of the entire telemetric system. Water supply network management also means care for water quality. In addition to monitoring the work of typical devices, such as deep-well pumps or hydrophore sets, we want to be able to control the basic physical and chemical parameters of water. Telemetry modules MT-101, enable downloading data from external devices equipped with communication port RS232/422/485. The next year will be for the Dataland staff the year of full use of this functionality. InVentia telemetry modules, water quality control devices and the DTL Monitoring IT system should constitute an indispensable tool for the daily work of the water supply infrastructure manager.



dtl Monitoring
dtl-scada.pl



Kenya Airport

Modernization of the Water Pumping Station

Peter Mbari – Blink Electrics Ltd., Kenya

„The rich functionality and high reliability make this device family our number one in the field of telemetry and applications performing remote supervision. Show us the work to do and we will add a new value to your company using MT-101. Just let us know and we will come up with a dedicated solution for you."
– Peter Mbari, Technical Director, Blink Electrics Ltd.

The pumping station is located at the international Kenya airport, about 4 kilometers from the water treatment station and water storage tanks. Prior to modernization, the old system required its administrators to constantly overcome distances each time there was a need to turn on or off the water pumps in the power stations. An additional element that forced frequent moving of the service personnel was the fact that the efficiency of the treatment station was smaller than the pump station. Before the installation of the telemetric system, when the pumping station was brought to life, there were frequent cases of overfilling of the tanks due to excess water flow in the treatment station, and as a consequence of this, the large amounts of water was being spilled. The process of dispensing chemicals also took place manually and often resulted in the operator adding amounts of chemicals improper in relation to the volume of water. In the case of malfunctions, it usually took a long time before they were noticed and diagnosed.

This state of affairs quickly had to change. Telemetry solutions have been very helpful for years and have been successfully offered by Inventia all over the world. One of the local Kenyan companies, Blink Electrics took advantage of the basic functionality of the MT-100 module, which is the MT2MT buffer, which enables to build a system working in the so-called cascade. It enables direct data transfer between distant points without the required additional infrastructure in the form of a central server. Thanks to this, the water treatment station was directly synchronized with the pump station, so that the water is now pumped only when the level in the tanks is not full. This reduced significantly the waste of energy, chemicals for treatment and water itself by eliminating its leakages.

The dosing of chemicals into the water has also been coordinated with the pumping station so that chemicals now are only added when the water flows from the remote pumping station. This ensured a uniform water treatment process, thus maintaining the required level of quality while maintaining a high degree of reliability.

Using the capabilities of the MT-100 telemetry module PLC, the installation system monitoring logic was programmed, and added notifications in the form of SMS messages are sent to the service staff in the event of a failure. In addition, administrators of facilities can monitor the system in real time from a computer using the MTManager program utility, obtaining all relevant information about the installation status.

blink ELECTRICS

Comparison table of telemetry and location modules, expanders and converters

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

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

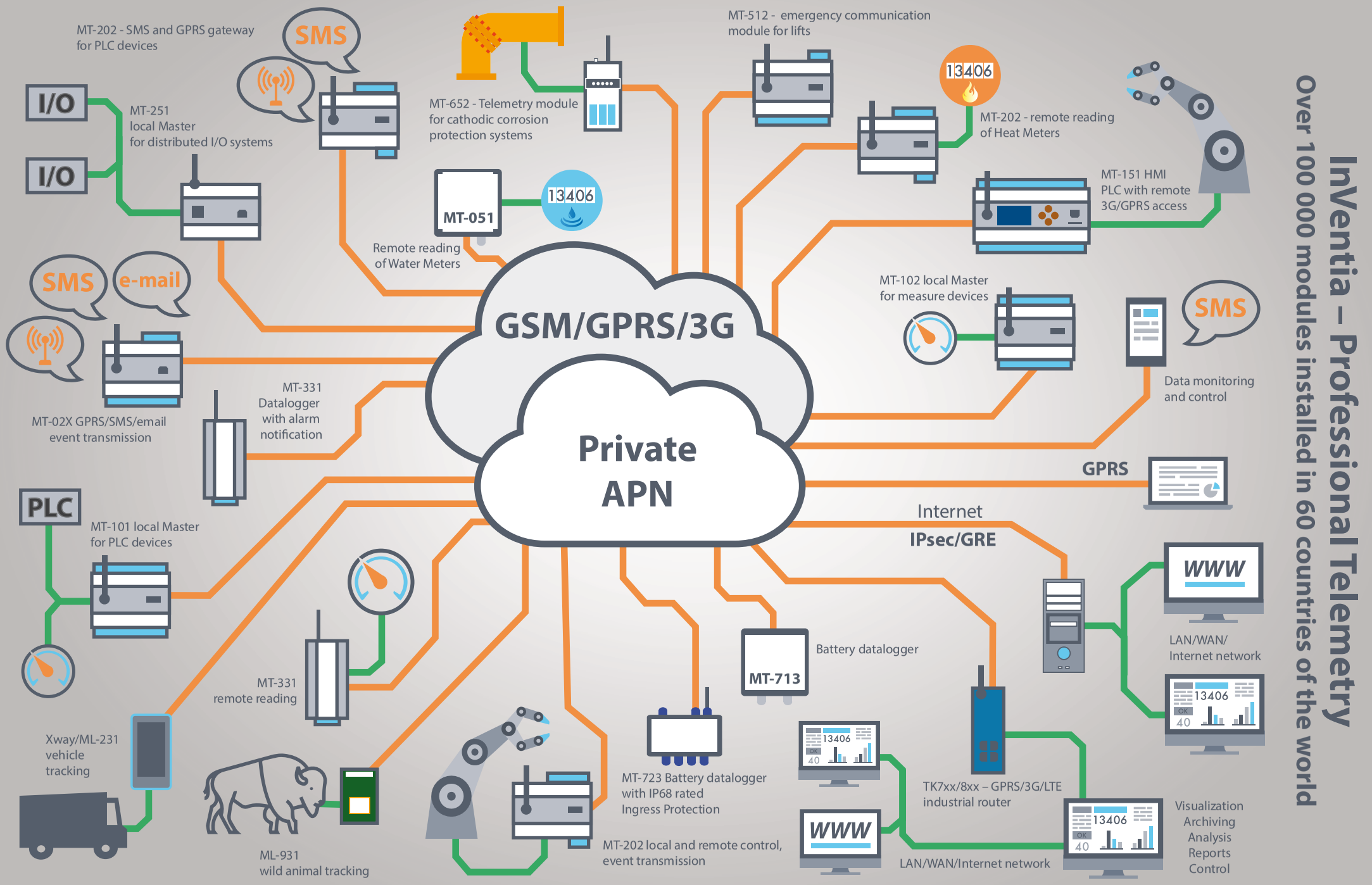
1) number of binary inputs/outputs and counter inputs is configurable
2) fmax = 100Hz
3) fmax = 250Hz
4) fmax = 1kHz
5) Modbus RTU Master/Slave, transparent mode, other…
6) password + internal list of authorized IP and telephone numbers
7) for 2 inputs
8) option
9) requires MTSpooler
10) in new version since Q3 2012
11) if connected to MT-101/102/202
12) RS-232 to M-Bus converter
13) external battery pack required
14) one dedicated input for pressure measurement
15) voltage measurement, peak detector, differential measurement
16) module is not receiving SMS asleep
17) battery 1 year
18) device status recorder
19) or -20...+55°C - depending on the version of the internal battery
20) Li-Ion
21) GSM i GPS
22) Output 1 for control external bistable relay
23) 2 optoisolated groups of analog inputs: 2x10/100 V and 200 mV input with 1 μV resolution
24) dedicated cable needed
25) M-BUS

Comparison table of telemetry and location modules, expanders and converters

FEATURES / MODULE	MT-652 Telemetry Module	MT-713 v.2 Telemetry Module	MT-723 Telemetry Module	MT-723 PT Telemetry Module	ML-231 Location Module	ML-941 Location Module	EX-101 Expander
I/O Resources						NEWEST	
Binary inputs	2	5	6	6	5	–	8 – 16[1]
Binary outputs	2	2	2	2	2	1	0 – 8[1]
Counter inputs	–	5[3]	5[3]	5[3]	2[1,2]	–	8 – 16[1,2]
Analog inputs	6[23]	3	3	3[14]	2[15]	–	2
1-wire input	–	–	–	–	YES	–	–
Real Time Clock (RTC)	YES	YES	YES	YES	YES	YES	–
Ethernet Port	–	–	–	–	–	–	–
Serial port RS232/422/485	1(0/0/1/0)	1(0/0/1/0)	–	–	1(0/0/0/1)[8]	1(0/0/0/1)[8]	2(2/1/1/0)
Voice channel	–	–	–	–	YES[8]	–	–
Functionality						NEWEST	
Local configuration via RS232/USB/ETH	–/+/–	–/+/–	–/+/–	–/+/–	–/+[24]/–	–/–/–	+/–/–
Remote configuration over GPRS	YES	YES[9]	YES[9]	YES[9]	YES	YES[9]	–
Unsolicited messaging	YES	YES	YES	YES	YES	YES	YES
Data packet sending	YES	YES	YES	YES	YES	YES	YES
SMS sending	YES	YES	YES	YES	YES	YES	–
User programming (lines of code limit)	–	–	–	–	–	–	1000
Standard serial protocols	YES[5]	YES[8]	–	–	YES	YES[8]	YES[11]
Data packet routing	–	–	–	–	–	–	–
Manual alarm setting for analog inputs	YES	–	–	–	–	–	YES
Number of analog input alarm levels	6	4	4	4	4	–	6
Remote read/write with SMS	YES	YES[16]	YES[16]	YES[16]	YES	YES[16]	–
Access control[6]	YES	YES	YES	YES	YES	YES	YES
Local mirroring of external resources	–	YES	–	–	–	–	–
Datalogger	YES	YES	YES	YES	YES	YES	YES
MT-DP compatibility (OPC, CSV, ODBC)	YES	YES	YES	YES	YES	YES	YES
Remote firmware upgrade over GPRS	YES	YES	YES	YES	YES	YES	–
Other						NEWEST	
Integral GSM/GPRS modem	YES	YES	YES	YES	YES	YES	–
SIM cards	2xSIM	SIM/MIM[8]	SIM	SIM	SIM/MIM[8]	SIM	–
3G network support	YES	–	–	–	–	–	–
Integral GPS receiver	YES	YES[8]	YES[8]	YES[8]	YES	YES	–
Integrated sensor T/H/P	T	T	T	T	T	T	–
DC power supply (V)/solar panel (PV)	7 – 30	9 – 30[8]	7 – 30	7 – 30	9 – 30	2 – 5	10,8 – 36
AC power supply (Vrms)	–	–	–	–	–	–	18 – 26,4
Power supply for external sensors (V)	–	0–5/15[8]/24[8]	0 – 5	0 – 5	–	–	–
Power supply monitoring input	–	YES/–	YES/YES	YES/YES	YES/–	YES/YES	YES/–
Rechargeable battery int./ext.	int.[20]	–	–	–	ext.	–	–
Internal battery supply	–	3/6xR20	1xR14[13]	1xR14[13]	–	YES[8]	–
Low power operation modes	YES	YES	YES	YES	YES	YES	–
External antenna connector/ISM	YES[21]	YES	YES	YES	YES	–	–
Protection class	IP65	IP67	IP68	IP68	IP40	IP54	IP40
Operating temperature range (°C)	-20...+55	-20...+55	-20...+60	-20...+60	-20...+55	-20...+55	-20...+65
Removable terminal blocks	YES	YES	–	–	–	–	YES
DIN rail mounting	YES[8]	–	–	–	–	–	YES
Warranty	3 years	3 years	3 years	3 years	3 years	3 years[8]	3 years
Built-in device	–	–	–	–	accelerometer	accelerometer	–

FEATURES / 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
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/ISM	–	–	–	–	YES	YES	–
Protection class	IP40	IP40	IP30	IP30	IP40	IP40	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	–	–	–	–	–	–	–

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
14) one dedicated input for pressure measurement
15) voltage measurement, peak detector, differential measurement
16) module is not receiving SMS asleep
17) battery 1 year
18) device status recorder
19) or -20...+55°C - depending on the version of the internal battery
20) Li-Ion
21) GSM i GPS
22) Output 1 for control external bistable relay
23) 2 optoisolated groups of analog inputs: 2x10/100 V and 200 mV input with 1 µV resolution
24) dedicated cable needed
25) M-BUS


InVentia – Professional Telemetry
Over 100 000 modules installed in 60 countries of the world
MT-202 - SMS and GPRS gateway for PLC devices
SMS
I/O
I/O
MT-251 local Master for distributed I/O systems
MT-652 - Telemetry module for cathodic corrosion protection systems
MT-512 - emergency communication module for lifts
13406
MT-202 - remote reading of Heat Meters
MT-151 HMI PLC with remote 3G/GPRS access
MT-051
13406
Remote reading of Water Meters
GSM/GPRS/3G
Private APN
SMS
e-mail
MT-02X GPRS/SMS/email event transmission
MT-331 Datalogger with alarm notification
MT-102 local Master for measure devices
SMS
Data monitoring and control
GPRS
PLC
MT-101 local Master for PLC devices
Internet
IPsec/GRE
WWW
LAN/WAN/ Internet network
13406
MT-331 remote reading
MT-713
Battery datalogger
Xway/ML-231 vehicle tracking
MT-723 Battery datalogger with IP68 rated Ingress Protection
13406
TK7xx/8xx – GPRS/3G/LTE industrial router
WWW
LAN/WAN/Internet network
13406
Visualization
Archiving
Analysis
Reports
Control
ML-931 wild animal tracking
MT-202 local and remote control, event transmission