INSA®
INDUSTRIJA SATOVA ZEMUN

ADO SYSTEM

remote readout systems

ADO M-Bus
04000168
V/4sec 3.6V
CE

Insa®
Qn2.5 PN16 m³

M-Bus
wireless

ADO automatic meter reading (AMR)

semi-automatic systems and automatic remote water meter reading

ADO SYSTEM
Remote water meter reading

INDUSTRIJA SATOVA ZEMUN

INSA ADO System
for remote water meter reading

INSA ADO Remote reading system is used for remote reading of water meters, calorimeters, gas meters and other consumption measuring devices. The system uses radio transmission as a basic medium for communication with the devices and the system can also be connected to other media and networks such as Ethernet, USB, Bluetooth or mobile telephony.

Radio communication in the remote reading system operates at two bands. Unlicensed ISM (Industry-Science-Medicine) bands on 868MHz and 2.4GHz and 4 types of protocols are used. RF868 radio protocol (INSA), wM-Bus radio protocol and LoRA protocol are used on 868MHz band and radio protocol RF24 (INSA) is used on 2.4GHz band.

wM-Bus protocol (Wireless M-Bus) is a radio protocol on 868MHz band in compliance with EN 13757-4 European Standard. It is used for reading the measuring devices at distances up to 1km in open space. It is characterized by one way communication (T1 mode) and under certain conditions two way communication (T2 mode) when parameterizing the device. Factory settings of the ADO devices using the wM-Bus protocol ensure that the data packet is sent every 6 seconds, but the transmission time can be increased in order to reduce the device consumption or at user's request. The universal wM-Bus protocol enables compatibility and reading of INSA ADO devices parallel to other systems (e.g., electric meters or calorimeters) of other manufacturers.

The RF868 protocol is designed for longer distances and up to 1 km in open space. It is intended for wireless remote reading of measuring devices (water meters, gas meters...) using the radio frequency of 868MHz and two way semi duplex communication. This protocol provides efficient data transmission via radio channel between application levels of the devices and software with different application levels. The RF868 protocol communication is based on the query-response principle. The device that starts the communication and sends the query is called the "master" device, while the responding device is called the "slave" device. Usually, the master device is a modem or a concentrator, while the slave device is usually a measuring device. There is also a special device, the repeater, which is located between the master and the slave devices and operates on the "store and forward" principle at RF868 protocol level.

The RF24 protocol is designed for shorter distances up to 10 m from the manhole and up to 50 m in open space. This protocol is used as an auxiliary protocol, as a wire substitute, to connect the sensor and data concentration with multiple sensors where high speed and resolution of reading are required.

LoRA protocol (Long Range) is a relatively new standard characterized by extremely large range. It is used to create communication networks based on a system similar to mobile telephony for the transmission of a small quantity of data. Radio modules are designed to allow the reception of extremely low signal levels. Key elements of LoRa technology are long range (up to 15 km), battery lifetime of over 10 years and CSS signal format.

Certain segments of ADO Remote Reading System can also use a GSM/GPRS mobile telephony network, a Bluetooth connection or a wired Ethernet, or M-Bus data transmission network.

Preparation of water meter for remote reading

Preparation of water meter for remote reading involves the adaptation of existing water meter in three ways:

- 1. by buying a new water meter

- 2. by servicing a water meter (includes replacement of the mechanism, glass cover and at least the (liter) pointer)

- 3. by adapting the existing water meter in the network (glass cover and the liter pointer replacement)

Adaptation of water meter involves replacement of the old glass cover with the glass cover prepared for remote reading. On the glass cover for remote reading the positions for mounting the ADO device (electronic module) are specified. It is also necessary to replace the liter pointer with the remote reading pointer which acts as pulse generator.

glass cover with carriers for ADO modules
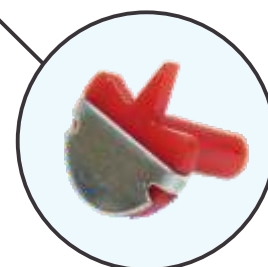
indicating device
(pulse generator)

appearance of water meter prepared for remote reading

the glass cover has two positions for mounting the ADO module
the indicating device is placed instead of the liter pointer

Methods of reading

Types of INSA ADO Remote meter reading system.

    - Wireless (via radio connection, GPRS/GSM or wireless network)

    - Wired (direct cable connection)

    - Combined (the meters are connected by cable to the module which transmits the data)

Wireless reading

Wireless reading involves reading of modules placed directly on the water meters and there is no wire connection between them and any other reading devices. The wireless reading can be carried out by the collectors and handheld terminals (PDA, Pidion or some other portable devices), or directly via GPRS/GSM network.
(wireless reading devices are: ADO868 Inductive, ADO868 Pulse, ADO-RF24 and ADO GSM Pulse, ADO GSM2)

Wired reading

Wired reading involves reading of modules placed on the water meters which are cable connected to a computer that collects and stores the read data.
(wired reading devices are: ADO-Mbus, ADO Pulse, ADO GATEWAY, ADO Terminal)

Combined reading

Combined reading involves wired and wireless reading of ADO devices placed on the water meters (the devices used for combined reading are: ADO868 Inductive, ADO868 Pulse, ADO M-Bus, ADO Pulse, ADO Gateway, ADO Terminal)

4

Wireless reading

INSA ADO Remote reading system consists of a number of devices created as a result of different situations when they are installed. All devices have in common:

- Battery life up to 15 years
- IP68 protection against moisture
- Operate on 868 MHz frequency ***

There are two methods of reading: reading directly in the field (utility worker) and reading from the monitoring center (via GPRS/GSM). Both methods have their use. The figure shows the reading by the utility worker which functions according to following principle:

The water meter containing the remote reading electronics is in the manhole. The Meter reader walks the street and sends the enquiry for desired information, which is usually the information on the direct flow, i.e. meter status. After the enquiry is sent, ADO module on the water meter responds to the enquiry. GPRS reading is identical and the only difference is that enquires (requests for information) are sent from the office.
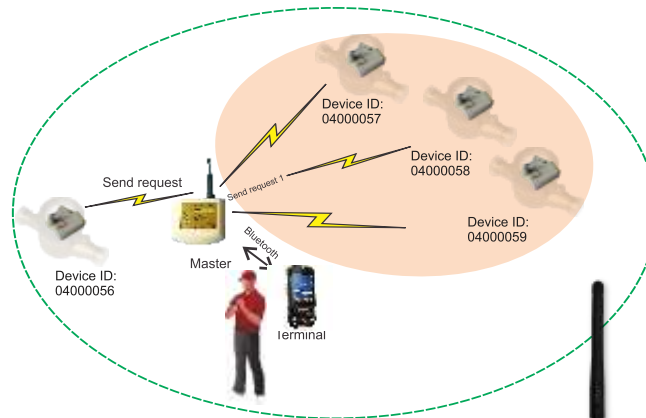
Devices for wireless remote water meter reading:

- **ADO868 wMBus**
- **ADO GSM2**
- **ADO Xponder Pulse**
- **ADO GSM Pulse**
- **ADO868 Inductive**
- **ADO-RF24**
- **ADO Modem**
- **Handheld terminal (with Windows Mobile platform)**

ADO GSM2 wmbus

ADO Modem

ADO868 wMBus

By adding ADO Gateway or ADO GSM devices, the system can be upgraded and the reading of data fully automated.

ADO868 wMBus

Characteristics:

Frequency: 868MHz (TI CC430F5137)
Output power: 10dBm
Receiver sensitivity: -97dBm
Antenna: l/4 helix -3dBm
Range: 600-800m in open space
Power supply: LiSOCl2 battery 3,6V, 2200 mAh
Average consumption: less than m15 A
Moisture protection: hermetically sealed casing (IP68)
Working temperature: -10oC to +65oC

ADO868Wmbus is a device designed for wireless reading of residential, industrial and combination water meters. The device has the integrated inductive sensors for direct installation on the water meter. The device is characterized by high output power. The operating frequency of the device is 868.95 MHz. The device is used for meter reading in standard and extreme conditions.

ADO868Wmbus device is suitable for installing in manholes and the range (depending on the manhole conditions) can be 10 m to 300 m around the manhole. In the cases of optical visibility the range of the device can exceed 1000 m. Reading is also possible from water-filled manholes.

ADO868Wmbus device offers the reading and transmission of the packets with information on direct and reverse flow, reading configuration and storing the status of certain dates, sending the information on leakage and pipe bursts alarms, and the alarm if the water meter has stopped working, the data on the battery status as well as tampering detection (removal of the module from the water meter).

ADO868Wmbus device has the option of encrypting the radio messages that can be defined by the user and the protection against unauthorized reading, the option to be configured via an encryption protected radio channel, protection against false representation of radio modules and/or changing the content, and an integrated RTC clock. The device is capable of radio packet transmission at pseudorandom intervals to avoid synchronous collisions. The reading software has the option to define the radio packets transmission interval and the capability of including the serial number of the water meter and transmitting that serial number in each radio message.

The device is powered by a 2200 mAh LiSOCl2 battery specially designed for use in telemetry. The battery ensures 15 years of device secure functioning (in normal operating conditions, with up to 4 monthly readings).

High quality casing and silicone filling provide IP68 level of protection for electronic components within the module so that the device can function in all weather conditions and is fully protected against the influence of temperature, moisture and when immersed in water. Inductive sensors prevent the use of magnets for the purpose of misuse, i.e. device and reading interference.

ADO868Wmbus device can be read individually by the handheld terminal and has the option of group reading. By adding ADO Gateway, ADO Gsm Wmbus device and ADO Terminal, it is possible to fully automate the reading. The software allows periodical sending of Wireless M-Bus radio packets which transmit the meter status and additional information depending on the configuration, one way communication.

ADO868Wmbus device is manufactured in compliance with EN13757 European Standard (Wireless M-Bus, OMS). There is an option for servicing the device and replacing the battery.

ADO GSM2 wMBus

Characteristics:

Reading: built-in Wireless M-Bus EN13757-4:2013 standard transceiver, mode
T1 in compliance with EU RED 2014/53/EU.
Sensitivity: -100dBm.
GSM modem Quad band: 900MHz, 1800MHz / 850MHz, 1900MHz
SMS and GPRS multi-slot class: 12/10
GPRS: mobile station class B compliant to GSM phase 2/2+
Parameterizing: Optical IrDA
Antenna: two external antennas for GSM and wMbus
Logger and alarm memory: flash 512kb, circular type
Typical way of sending a report: E-mail, periodically, usually once a day.
Power supply: two separate batteries for microcontroller and GSM
Typical battery life: for the reading of 16 meters with one e-mail message per week, 5 years.
Working temperature: -20°C to +50°C
Casing: Plastic IP65, 120x65x40mm.

ADO GSM2 wmbus device is designed for transmitting the status readings to a remote computer via GSM/GPRS network.

A remote computer can be anywhere in the world provided that it has an internet connection. One ADO GSM2 device can be connected to (transmit) maximum of 16 slave devices (in this case ADO wM-Bus devices). Ado GSM2 device needs to be installed as high as possible above the ground (for its installation are usually used the existing electrical power or telephone poles) and within the range of wM-Bus devices we intend to read.

The ADO GSM2 device can be configured to log individual status for each water meter at a predetermined date and time and to transmit the logged data via GSM network to e-mail server.

The INSA Web application (software) pulls up the statuses from the e-mail server and stores the data on the Cloud service. In web application the data can be viewed, printed or exported to one of the standard formats that can be imported into billing and collection software.

ADO GSM Pulse
(zonal meter)

Characteristics:

Input: Reed or Open collector
Output: GPRS transceiver
Output power: 0dBm
SMS and GPRS multi-slot class: 12/10
GPRS: mobile station class B Compliant to GSM phase 2/2+
Parameterizing: Optical IrDA
Antenna: external GSM
Logger and alarm memory: permanent flash 512kb, circular type
Typical way of sending reports: e-mail, periodically, usually once a day
Power supply: two separate batteries for microcontroller and GSM
Typical battery life: the reading and one e-mail message per week, 5 years
Working temperature: -20°C to +50°C
Casing: Plastic IP65, 120x65x40mm.

ADO GSM device is designed for use in combination with water meters which have reed or open collector impulse outputs. The device has 4 pulse inputs for counters and 4 alarm inputs. This means that to the device can be connected up to 4 water meters (e.g., 4 separate residential water meters or 2 industrial combination water meters).

ADO GSM device comes with its own battery power supply containing 2 LiSOCl2 batteries that ensure sending of one e-mail or one text message a day for at least 5 years. The device counts the received pulses and can be programmed to store and transmit data at a predefined interval or date and time. Consumption data is sent to the e-mail server in the form of e-mail messages and from there the data can be downloaded and stored in a desktop computer. Alarms can be sent via text message to a desired telephone number.

If used as a zonal meter, the device can be configured to log the status of the combination meter at a specific time interval which is adjustable according to customer's request. Logging can be configured as per month, week, day, hour or minute (minimum) and the report (logged statuses) sent to an e-mail account once a day.

ADO Xponder Pulse

Characteristics:

Frequency: 868MHz (Analog Devices ADF7021)
Transmitter output power: 13dBm
Receiver sensitivity: -114dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ±4kHz
Modulation: 2FSK
Antenna: l/4 -3dBi
Range: app. 1000 m in open space
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA

ADO868 Pulse is designed for wireless reading of residential and industrial water meters, gas meters and calorimeters.

The device has a digital pulse input on which it counts and stores the pulses received from the attached pulse encoder with a volt free contact (reed contact or open drain). The number of pulses is stored in memory and the status can be further read at any time via radio reading.

Like other ADO system devices it offers 24 monthly memory logs, alarm in case of leakage, pipe burst and water meter ceasing to work.

To connect with residential water meters, ADO Pulse device makes the link, as a pulse encoder, which inductively counts the rotations of the "liter" pointer on the water meter. It is possible to connect up to maximum 4 residential water meters to one ADO868 Pulse device.

For industrial water meters with pulse output, reed contact is directly connected to one of the ADO868 Pulse device inputs. It is possible to connect up to maximum 4 industrial water meters (4 reeds) to one ADO868 Pulse device.

Combining the ADO Pulse devices and reed outputs is also possible with combination water meters so the device is suitable for combination water meters reading. It is possible to connect up to maximum 2 combination water meters (or, for example, one combination water meter and two industrial water meters).

With residential water meters, it is most suitable for use at the measuring points that are occasionally or constantly under water since ADO868 Pulse is attached under the manhole cover which ensures that antenna is not under water and that the signal emitting from the manhole is not obstructed.

ADO 868 Pulse devices, depending on the conditions in the manhole, can have the range of 50 m to 300 m around the measuring point.

ADO Modem

Characteristics:

Bluetooth: OEM Parani ESD200, Class 2
Frequency 1: 2.4GHz (Nordic Semi nRF2401)
Transmitter output power: 0dBm
Receiver sensitivity: -90dBm
Data transfer rate: 250kbps
Bandwidth: 1MHz
Modulation: GFSK
Frequency deviation: ± 156KHz
Antenna: Bent monopole on printed circuit board about -6dBi
Range: about 80 m in open space, about 10 m in a manhole.
Frequency 2: 868Mhz (Analog Devices ADF7021)
Transmitter output power: 13dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ± 4kHz
Modulation: 2FSK
Antenna: External monopole 2.2dBi
Range: app. 1000 m in open space
Power supply: Rechargeable LiION battery 3.7V, 1200mAh
Average consumption: about 60mA

ADO Modem is a device designed for wireless remote reading of ADO module on water meters. The Modem serves as a communication link between the radio modules on the water meters and the handheld terminal.

ADO Modem makes an indispensable part of the reading equipment and the collector must carry it along with the handheld terminal when reading the water meters. The distance between the ADO Modem and the handheld terminal during reading shall not exceed 10 m. The modem has IP65 protection.

Rechargeable 1200mAh Li ION battery ensures independent operation of the device for 10 hours with single charging.

Adding the vacuum stand for modem and magnetic antenna that sticks to the roof, ADO modem becomes part of the equipment for the reading from a car.

Bluetooth

INSA
Radio protocol/wmbus

ADO868 Inductive

Characteristics:

Input: inductive rotation sensor (operating frequency 600 KHz)
Frequency: 868MHz (Analog Devices ADF7021)
Transmitter output power: 13dBm
Receiver sensitivity: -114dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ± 4kHz
Modulation: 2FSK
Antenna: l/4 helix about -3dBi
Range: about 1000 m in open space
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA

ADO868 Inductive is a device designed for wireless reading of residential, industrial and combination water meters. The device is characterized by high output power. The operating frequency of the device is 868Mhz. The device is used for meter reading in standard and extreme conditions.

The ADO868 Inductive is suitable for installation in the manholes and the range (depending on the conditions in the manhole) can be 10 m to 300 m around the manhole. In the case of optical visibility the range of the device can exceed 1000 m. The reading is also possible from water-filled manholes.

The ADO868 Inductive device offers direct and reverse flow reading, 24 monthly memory logs, configuration of status reading and logging on a specific date, leakage, pipe bursts and alarm when water meter has stopped working, battery status information, as well as tampering detection (module removal from the meter).

Ado 868 Inductive device can be read individually by handheld terminal and also has the option of group reading. The device operates at enquiry/response principle. It is necessary to send an enquiry to which the device responds accordingly. If there is no polling, the device goes to sleep mode for battery saving.

By adding ADO Gateway device and ADO Terminal it is possible to fully automate the reading.

ADO RF-24

Characteristics:

Input: inductive rotation sensor (operating frequency 600 KHz)
Output: radio transceiver 2.4 GHz
Output power: 0dBm
Receiver sensitivity: -90dBm
Data transfer rate: 250 kbps
Antenna: wire dipole -6dBi
Range: about300 m in open space and 10 m in the manhole
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA

ADO RF-24 is the only ADO System device operating on 2,4 GHz frequency. The device is suitable for applications requiring high speed of reading (real-time consumption tracking). Due to somewhat smaller range it is not suitable for installation in manholes. It is designed for installation in above-ground cabinets where the reading can be fully automated using the ADO Gateway and the real-time consumption tracked on a computer at a remote center with data refreshing every 4 seconds.

Drive by/Walk by reading

Drive-by/Walk-by reading is carried out with handheld terminal and ADO Modem which requires the collector to physically pass by each measuring point and collect data from the water meter. The collector can walk or drive by the measuring points. For drive-by reading, beside the ADO modem and handheld terminal, the collector should also have a magnetic antenna mounted on the car roof.

The picture shows the example of "Drive-by" method of remote reading. The collector is driving at the speed of 10-15 km/h and collecting the data. This reading method allows data collecting from a large number of water meters in a short time interval. One collector with a car can read thousands of water meters in one day.

The example of Walk-by/Drive-by reading in urban areas

www.insa.rs
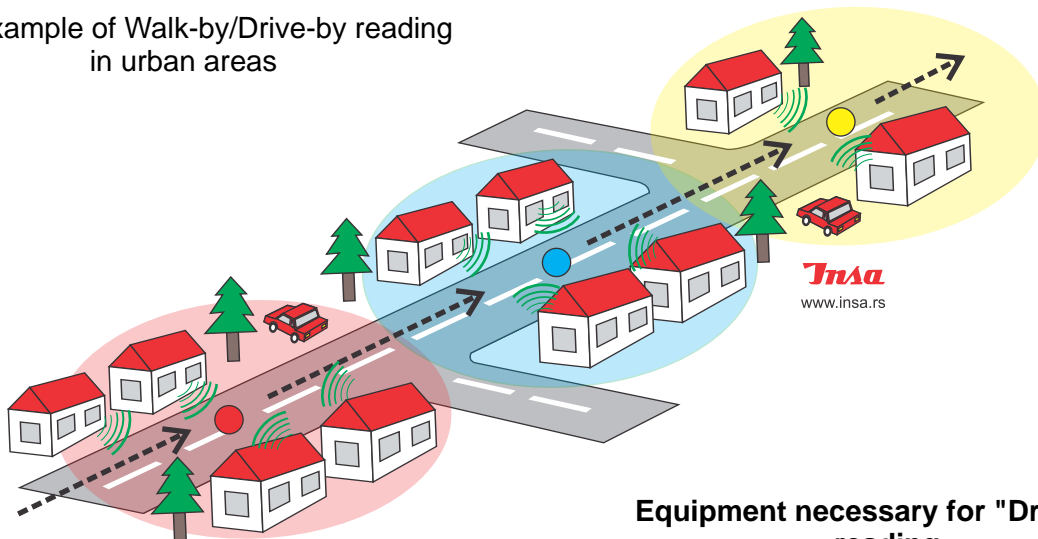
Equipment necessary for "Drive-by" reading

Handheld terminal
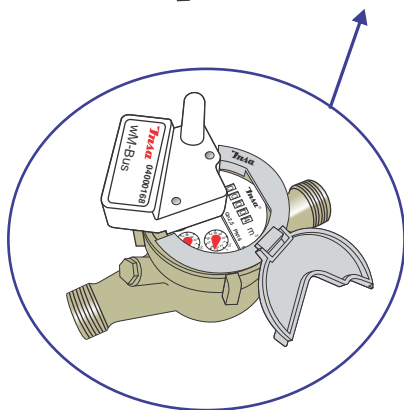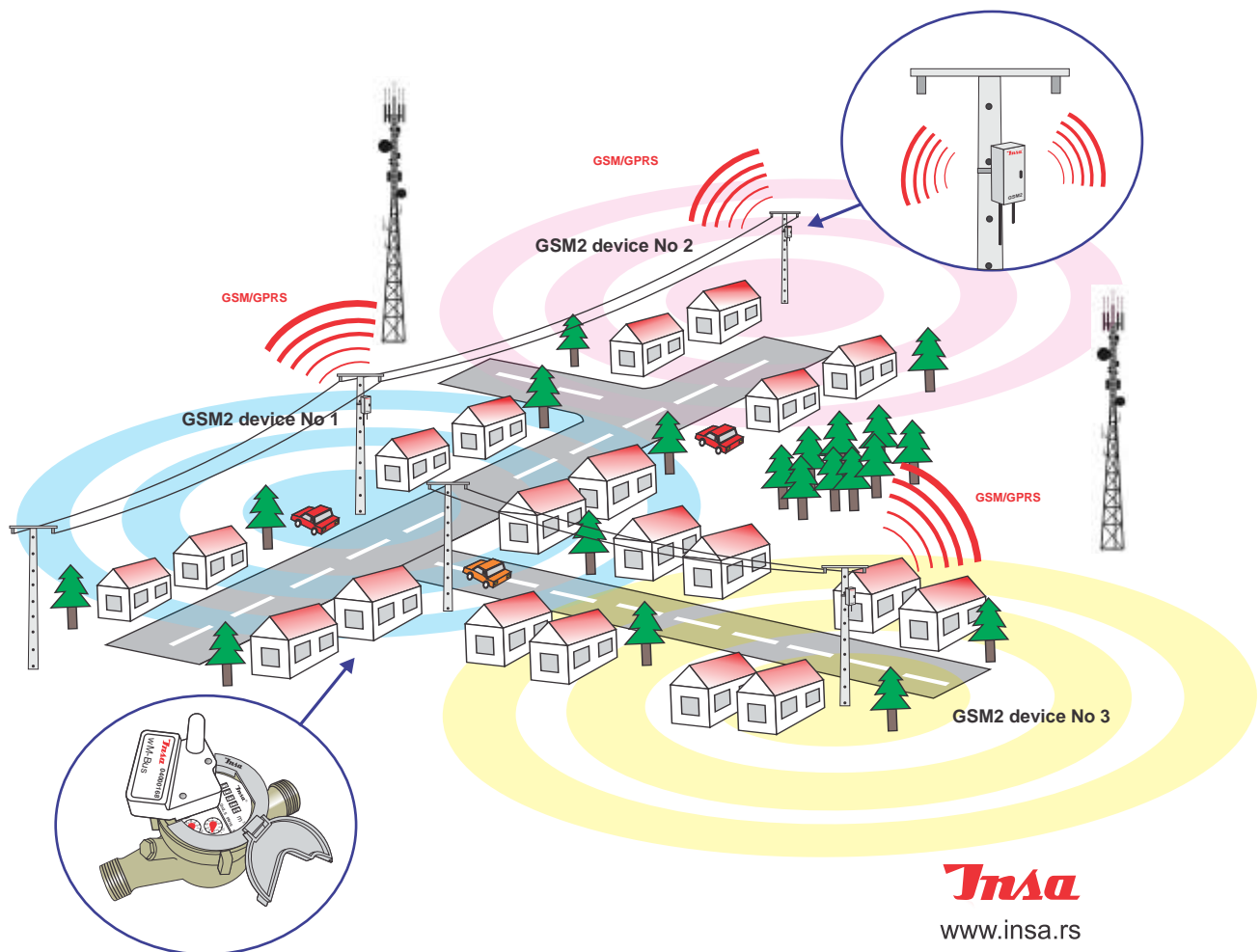
ADO Modem

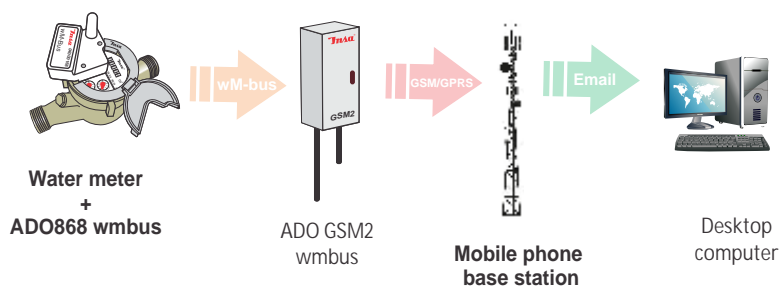Water meters with ADO868 wmbus modules

magnetic antenna for the car roof

Automatic reading with ADO GSM2 wmbus device

The example of reading a large number of water meters with the ADO GSM2 wmbus device and the ADO868 wMBus module on the water meters located in the manholes. ADO GSM2 wmbus devices are mounted on electrical power poles and at the predefined date collect the data from the water meters and store them in memory. At the specified time ADO GSM2 device sends the collected data to the e-mail server via the GSM network (sim card) from where they are then downloaded by INSA software and stored in the database. Each ADO GSM2 wmbus device can collect statuses from maximum 16 water meters.

GSM/GPRS

GSM2 device No 2

GSM/GPRS

GSM2 device No 1

GSM/GPRS

GSM2 device No 3

www.insa.rs

The chain of communication and the data path

Water meter + ADO868 wmbus → wM-bus → ADO GSM2 wmbus → GSM/GPRS → **Mobile phone base station** → Email → Desktop computer

Wired reading

Wired remote reading involves the collection of data from measuring points - water meters via cable (wire connection). The modules are connected by cable to one of the devices which store and then distribute the data. There are two types of data transmission by cable:
- M-Bus design
- PULSE transmission

of pulses from the water meter to any of the devices that detect and count the pulses (Scada, PLC, ADO Terminal or some other device). Insa ADO devices for wired reading have their own battery power supply. Same as with other ADO devices, these are LiSOCl2 batteries specially designed for use in telemetry. For wired connection are used top quality silicone-coated cables resistant to all weather conditions.

All modules for wired remote reading have IP68 protection and are fully resistant to moisture and temperatures ranging -25oC to +80oC.

INSA also offers complete software solutions for wired reading of water meters.

Devices for wired remote reading of water meters:

- ADO Pulse

- ADO M-Bus

- ADO Terminal

By attaching the module to ADO Terminal device, it is possible to fully automate the reading.

ADO Pulse
adapter for wired remote reading

Characteristics:

Input: inductive rotation sensor (operating frequency 600 KHz)
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA
Output: pulse (1 pulse per rotation)

ADO Pulse device is designed for reading residential, industrial and combination water meters. ADO Pulse device has an inductive sensor that counts the rotations of the "liter" pointer and converts the rotations into pulses on the output. ADO Pulse device acts as a reed contact except it does not use a magnet for rotation transmission. Its advantage over the reed contact is that it is impossible to disrupt the inductive sensor by a magnet and therefore the possibility of tampering is eliminated.

When combined with the ADO868 Pulse device it is possible to connect up to maximum 4 residential water meters. The device is also used with combination water meters to connect both meters (industrial and residential water meter). Independently of INSA ADO System, the device can connect to any other device which accepts the pulses.

ADO Pulse is powered by a 2200 mAh LiSOCl2 battery designed for use in telemetry. The battery ensures 15 years of secure device operation. High quality casing and silicone filling provide the IP68 level of protection for electronic components within the module so that the device can operate in all weather conditions and is fully protected against the influence of temperature, moisture and when immersed in water. Top quality silicone insulated cable is resistant to moisture and temperature influences.

Its most common application with residential water meters is in situations when the measuring point is occasionally or constantly under water. In such case, by connecting to ADO868 Plus device we obtain unobstructed reading regardless of the measuring point being under water.

The devices are manufactured with a standard cable length of 1.5 meters but can be manufactured with any cable length depending on customer's requests or needs. Cable lengths of more than 10 m are not recommended.

ADO M-Bus
adapter for wired remote reading

Characteristics:

Data transfer rate: 9.6kbps
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA

Technical characteristics:

Cable length: 1,5 m to 10 m
Hermetically sealed casing (IP 68)
Temperature:
Working temperature: -10oC to + 65oC
Storing: -20oC to +65oC
Pulse outputs (I1and I2)
Open drain transistor switch according to ISO/TC30
Vmax: 24V / Imax: 20mA / Pmax: 0,48VA /f max: 5Hz
Max. voltage with closed switch 0,3V + I * 250W
If the "data" output is not used, serially connected resistance
can be reduced by 150W by connecting the brown and green wire.

The pulse duration is 124 ms (fixed)

ADO M-Bus device falls into INSA group of products designed for wired remote reading. The devices are adapted for mounting on standard residential, industrial and combination water meters prepared for remote reading. The length of the cable that comes with the ADO M-Bus devices is typically 1.5 m and devices with greater cable length can be manufactured at request.

The feature of the M-Bus system is fast response, stability and reliability in functioning. When connecting the device, the ranges, i.e. cable lengths up to 300 m, are provided with one "master" device. For greater distances it is necessary to add the repeaters or increase the cross-section of the cable connecting the M-Bus system.

ADO Pulse is powered by a 2200 mAh LiSOCl2 battery designed for use in telemetry. The battery ensures 15 years of device operation. High quality casing and silicone filling provide the IP68 level of protection for electronic components within the module. The device operates in all weather conditions and is fully protected against the influence of temperature, moisture and when immersed in water. Top quality silicone insulated cable is resistant to moisture and temperature influences.

- Cables used for M-Bus networking

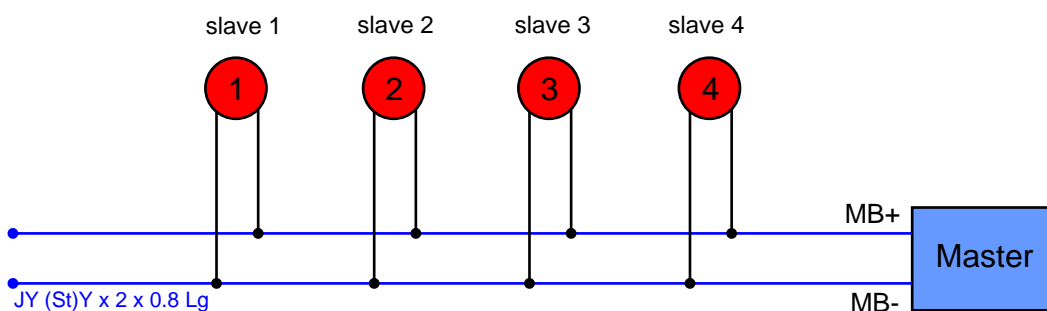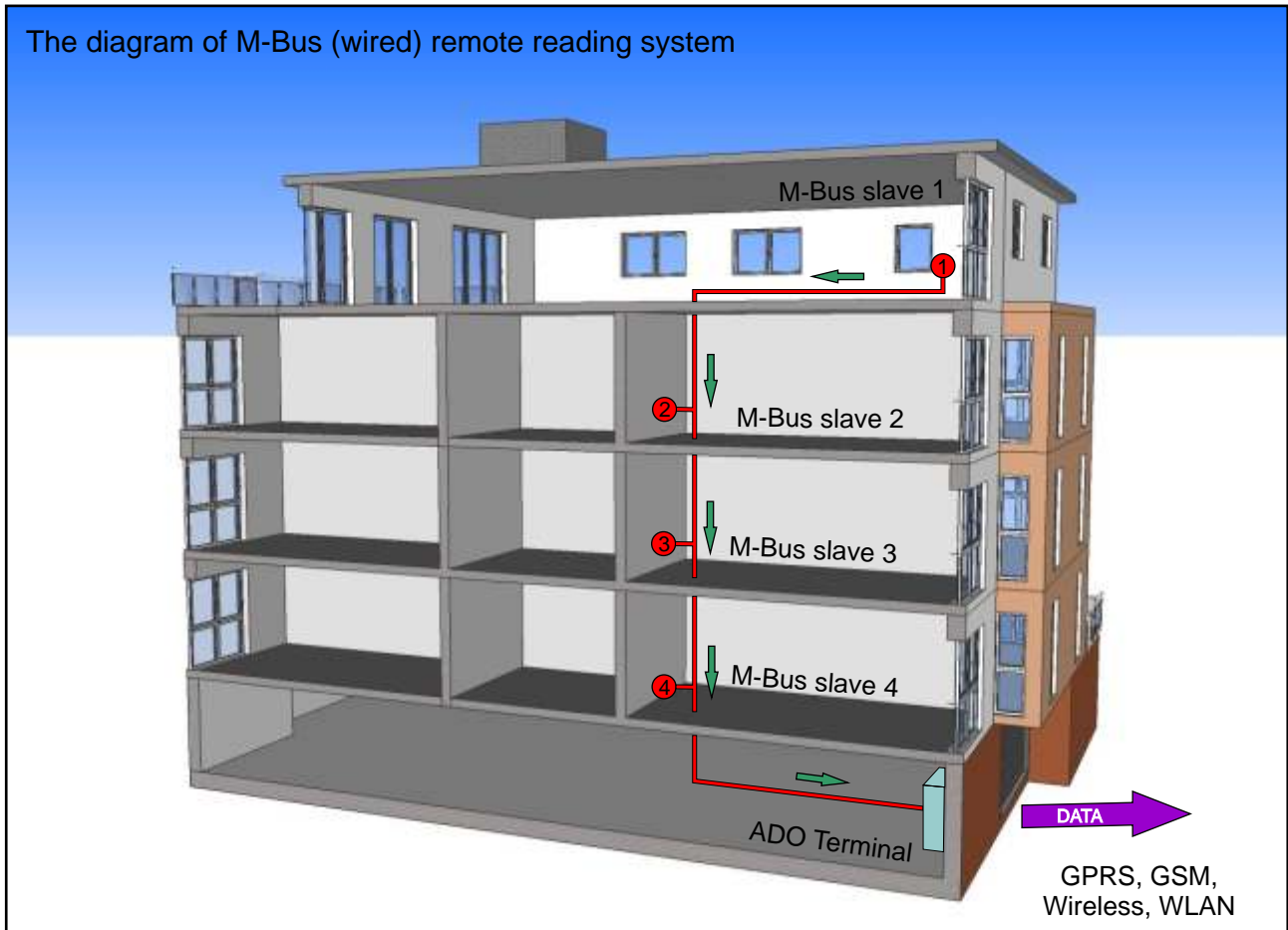Cable which is typically used for connecting the M-Bus device is marked as "JY (St)Y * 2 * 0.8 Lg" (asterisk means "times"). This is a standard two-wire cable protected with plastic wrap and metallized plastic foil that protects the conductors from interference. The cable consists of two copper wires 0.8 mm in diameter (0.5 square in cross section), with full cross section. The cable need to have a resistance of no more than 73 ohms/km and the capacitance for a 1000-m cable should be about 180 nF.

A cable of up to 300 m in length is used for M-Bus and it is allowed to attach maximum 250 slave devices to it. Under certain circumstances, if there are fewer slaves it is possible to put longer cable but it is not recommended. For lengths greater than 300 m, repeaters shall be used.

The total resistance of conductors should not exceed 29 ohms per 350 m of this cable.

Wired reading system

The diagram of M-Bus (wired) remote reading system

M-Bus slave 1

M-Bus slave 2

M-Bus slave 3

M-Bus slave 4

ADO Terminal

DATA

GPRS, GSM,
Wireless, WLAN

slave 1   slave 2   slave 3   slave 4

1   2   3   4

MB+

Master

JY (St)Y x 2 x 0.8 Lg

MB-

The picture above shows the diagram of ADO M-Bus system in a four-storey building. Water meters located on each floor are cabled to central ADO Terminal unit which performs automatic reading at predefined interval. The consumers in the building can check at any point, using the USB key, the status on their meter and ADO Terminal can be configured to send the data readings via GSM/GPRS network or internet connection to a remote server or computer for further data processing.

ADO Terminal
central unit for remote reading

Characteristics:

Operating system: Windows XP®
Power supply: 220V AC
Entry: Touchscreen display
Communication: Wlan, Wireless, GPRS, Bluetooth
Input: M-Bus, pulse (reed), Wlan (gateway), Radio
Security: USB key
Installation: on the wall or in the cabinets

ADO Terminal is a device designed for reading all types of ADO devices. The ADO Terminal has INSA ADO Remote Reading Software installed which provides:
- fully automatic reading of the meters,
- the option of instant review,
- sending the data to a remote server or computer.

ADO Terminal has the capability to connect to all ADO devices either via cable, Bluetooth or radio. It also has the capability to connect to the existing computer network (wlan or wireless) or the Internet, which allows data transmission to any distance.

The USB key prevents the unauthorized use of the ADO Terminal device and at the same time enables anyone with the key to check the status of their meter at any time. Logging with a user or administrator password limits access to system settings. User account gives an option to review the data and statistics while the administrator account has the option of data reviewing, data exporting to other formats as well as system configuration, changing the user data and changing the reading parameters (interval, reading groups, network settings, etc.).

ADO Terminal can be used for wired, wireless and combined reading.

All ADO modules for remote reading are compatible with ADO Terminal device.

ADO Gateway

General characteristics:

Frequency 1: 2.4GHz (Nordic Semi nRF2401)
Transmitter output power: 0dBm
Receiver sensitivity: -90dBm
Data transfer rate: 250kbps
Bandwidth: 1MHz
Modulation: GFSK
Frequency deviation: ± 156KHz
Antenna: external monopole 2.2dBi
Range: about 80 m in open space
Frequency 2: 868Mhz (Analog Devices ADF7021)
Transmitter output power: 13dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ± 4kHz
Modulation: 2FSK
Antenna: External monopole 2.2dBi
Range: about 1000 m in open space
Power supply: 8-28V DC
Average consumption: about 60mA
Connection: RJ45 DIGI CONNECT ME network
connector (RS232, RS485 optional)
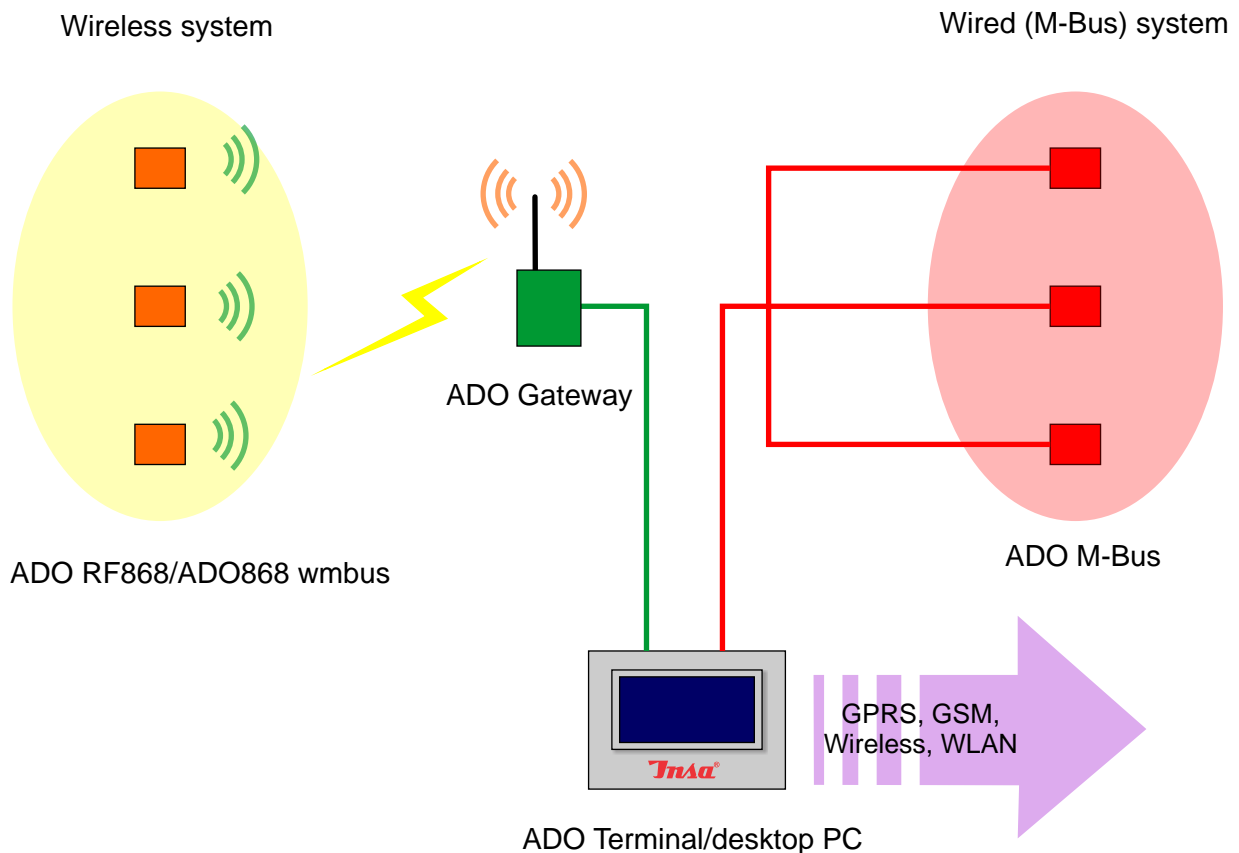Installation: 35mm DIN rail or mounting on the wall

The ADO Gateway device is designed for automatic radio reading of wireless ADO devices. The device is permanently installed in a cabinet or on the wall within the range of ADO devices which are being read. Via classical UTP network cable (Class 5) ADO Gateway device is connected to ADO Terminal device which is configured to automatically perform the polling and reading of the devices. Also, using the ADO Gateway hub or router, it is possible to connect directly to a desktop computer from which manual or automatic data reading can be performed. ADO Gateway is made in two variants. One variant is designed to read devices operating on INSA RF 868 radio protocol (ADO868 Inductive, ADO RF24, ADO Xponder Pulse and ADO RF Valve) and the other is designed to read the device on a wmbus protocol (ADO868 wmbus).
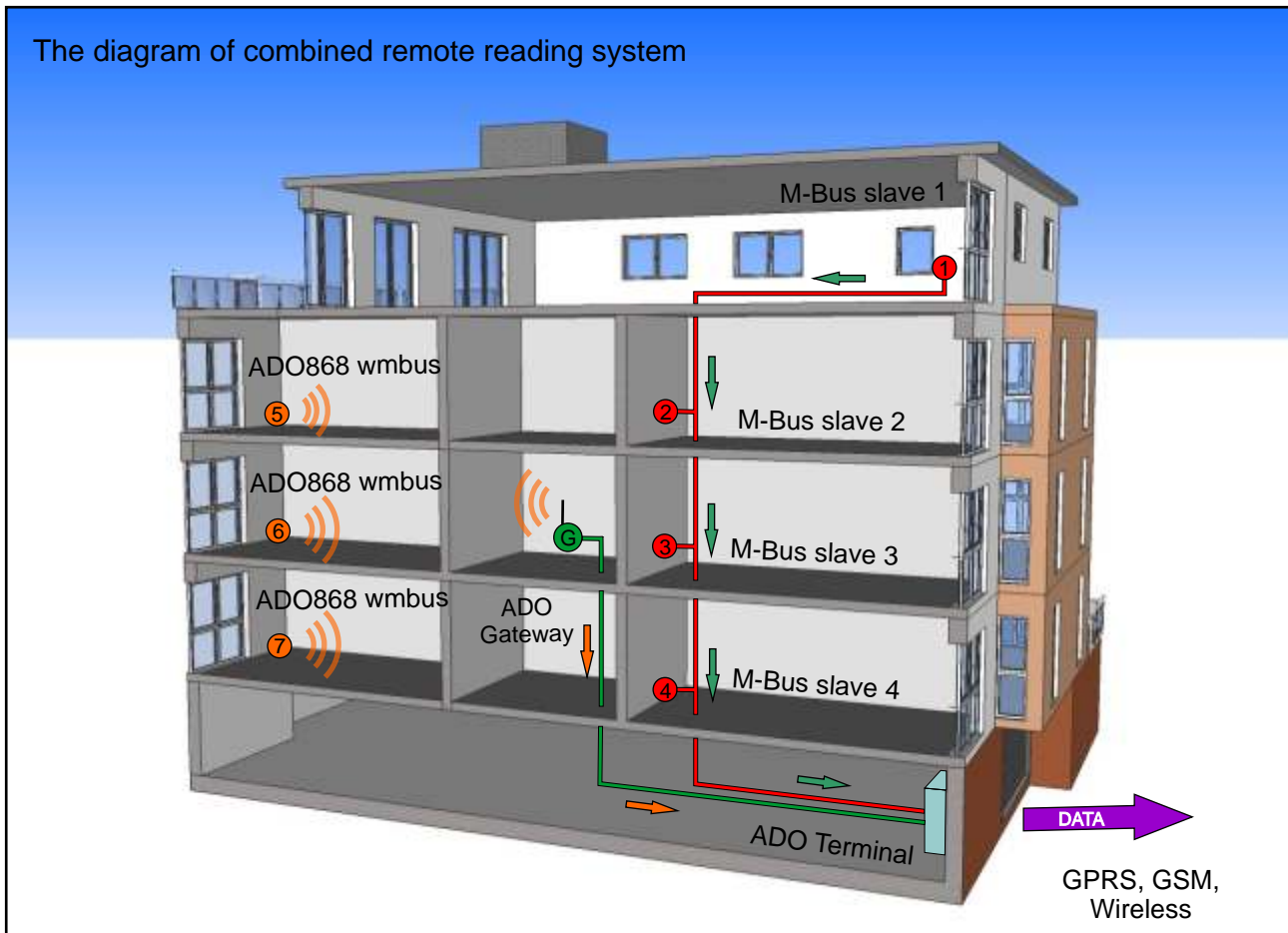
Combined reading

For combined reading we use wired and wireless ADO devices. Together they perform automatic reading of a large number of meters. By using ADO Gateway device, a "CONNECTION" between wireless devices and an existing wired system is established so that the data, for example from the existing M-Bus network, can be used simultaneously with the data from a wireless network on ADO Terminal device which will then display or transmit the data to a remote server or computer.

Combined readings are used in situations where two existing networks, wired and wireless, need to be connected, or in situations where it is needed to make a wired network, but for technical reasons the cabling to all measuring points is impossible, so inaccessible devices need to be read wirelessly.

Wireless system   Wired (M-Bus) system

ADO RF868/ADO868 wmbus   ADO Gateway   ADO M-Bus

GPRS, GSM,
Wireless, WLAN

ADO Terminal/desktop PC

Combined reading diagram

The diagram of combined remote reading system

M-Bus slave 1

ADO868 wmbus

M-Bus slave 2

ADO868 wmbus

ADO Gateway

M-Bus slave 3

ADO868 wmbus

M-Bus slave 4

ADO Terminal

DATA

GPRS, GSM, Wireless

The picture above shows the diagram of combined reading in a four-storey residential building. The flats on the right are wired by M-Bus System. Due to impossibility of cabling through the flats on the left side of the building, wireless ADO868 devices are mounted on the water meters. To obtain the reading of ADO868 device the cable is run to ADO Gateway device (concentrator).

The Gateway is optimally positioned, within the range of all three ADO868 devices, thus performing the polling and reading of the device. The data readings are then transmitted to ADO Terminal or a desktop computer for further processing.

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Other devices and equipment
for remote reading

In order to make it easier for users and to speed up the reading, besides the reading devices INSA also offers accessories which enable the drive-by reading.

The accessories are:

- handheld terminal for remote reading
- magnetic and vacuum antennas for drive-by reading
- ADO Modem stand for a car
- a laptop computer stand for a car
- 12/220v for a car

Handheld terminals

magnetic antenna
for car roof

vacuum stands

24/220V voltage converter
for a car

a laptop computer stand
for a car

Flow control

ADO RF/LoRa Valve, ADO M-Bus Valvel

In addition to devices used only for meter reading, INSA also offers the devices used for the flow regulation of water, gas and other fluids and which can be activated by remote control, either via cable, radio or GPRS/GSM.

Basically, these are ball valves of different cross-sections that have an integrated actuator, electronic control module and their own battery power supply.

For cable-connected devices (m-bus system), the battery is recharged from the network and the device has unlimited number of opening and closing cycles, while in radio and/or GPRS/GSM devices the battery cannot be recharged and provides about 800 opening and closing cycles after which the device can be serviced, i.e. the battery replaced.

There are two types of ADO valve:

- ADO RF/LoRa Valve (valve with radio communication)
- ADO M-Bus Valve (valve controlled via M-Bus network)

There are several types of closing:

- Complete closing or opening (OFF/ON function)
- Partial opening or closing (for example, decreasing the flow to a certain percentage)
- Time-controlled closing and opening
- Closing after certain flow - pre paid billing model

- Complete closing is for the total stoppage of the flow. It is used in industry to stop the supply of water or gas to the system or in water supply facilities to shut down parts of pipelines when the system is being maintained. It can also be used to stop the supply of water or gas in cases when the consumer fails to pay the bill. Complete closing and opening can be done via handheld terminal (PDA) or by sending a request via M-bus network if that is the valve type.

- Partial opening and closing means that the valve only partially closes (to a certain percentage of total flow) which can decrease the flow rate in steps of 10%. In this way it is possible to limit the maximum consumption with the purpose of big water consumption saving or sanctioning irregular payers by reducing their water flow. Partial opening and closing can be done via PDA device – via radio or M-bus network if these are ADO M-Bus valves.

- Time-controlled opening and closing is a function that allows the valve to be programmed and closed or opened on a precisely defined date or time period - interval (for example, every day the valve opens at 8:00 am and closes at 16:00). The programming is performed via PDA or M-Bus network.

- Closing after a certain flow requires the valve to be positioned coupled with the meter and electronic module for remote reading. After the predefined amount of water or gas passes, the valve closes automatically and can be opened only by PDA or a command from the M-Bus network if it is a device of that type.

Example: When renting an apartment, the tenant pays for a certain amount of water in advance, say 10m3. When 10m3 passes through the meter, the valve automatically shuts down water supply and the tenant must again pay for the water at the reception desk. Upon payment, the receptionist presets the amount of water that the tenant has paid for and the valve reopens and discharges the amount of water defined by the receptionist.

ADO RF/LoRa Valve

Characteristics:

Frequency: 868MHz
Transmitter output power: 13dBm
Receiver sensitivity: -114dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ± 4kHz
Modulation: 2FSK
Antenna: l/4 helix about -3dBi
Range: about 1000 m in open space
Power supply: LiSOCl2 battery 3.6V
Number of cycles (closing - opening): about 800
Closing time: 5 sec

ADO RF/LoRa Valve is a valve designed for automatic remote closing and opening for which the command close/open is sent wirelessly, i.e. via radio. The valve is widely used in water and gas supply systems, industry, food industry as well as in irrigation systems. The valve can be used for flow control of any fluid provided it is not chemically aggressive and it does not exceed the temperature of 90oC nor the pressure of 10 bar.

The valves are manufactured in standard sizes DN15 to DN50. They use their own LiSOCl2 battery supply (3,6V) which provides for about 800 close-open cycles.

The device has following functions:

   - Complete closing or opening (OFF/ON function)
   - Partial opening or closing (for example, decreasing the flow to a certain percentage)
  - Time-controlled closing and opening
  - Closing after certain flow

The valve can be used as a conventional valve and close and open the flow by the remote (wireless) command when needed. In addition to its standard function of complete closing and opening on request, the valve also has option to reduce the flow to a certain percentage, time-set, fully automatic opening and closing (configuring the valve when to open and when to close).

If the valve is used in combination with the water meter and the wireless ADO module for remote reading, the valve can be configured to close after a certain quantity of water has passed through the water meter, making it particularly suitable for use in hotels, weekend settlements or anywhere else where water or gas should or can be billed by pre paid system.

ADO M-Bus Valve

Characteristics:

Input: inductive rotation sensor (operating frequency 600 KHz)
Frequency: 868MHz (Analog Devices ADF7021)
Transmitter output power: 13dBm
Receiver sensitivity: -114dBm
Data transfer rate: 9.6kbps
Bandwidth: 25kHz
Frequency deviation: ± 4kHz
Modulation: 2FSK
Antenna: l/4 helix about -3dBi
Range: about 1000 m in open space
Power supply: LiSOCl2 battery 3.6V, 2200mAh
Average consumption: less than 15µA

ADO M-Bus Valve is a valve designed for automatic remote closing and opening for which the command close/open is transmitted via cable, i.e. via M-Bus network. The valve is widely used in water and gas supply systems, industry, food industry as well as in irrigation systems. The valve can be used for flow control of any fluid provided it is not chemically aggressive and it does not exceed the temperature of 90oC nor the pressure of 10 bar.

The valves are manufactured in standard sizes DN15 to DN50. They use their own LiSOCl2 battery supply (3,6V) which is upon valve closing/opening recharged from M-Bus network and the life of the battery is practically unlimited.

The valve can be used as a conventional valve and close and open the flow by the remote (wired) command when needed. In addition to its standard function of complete closing and opening on request, the valve also has option to reduce the flow to a certain percentage, time-set, fully automatic opening and closing (configuring the valve when to open and when to close).

If the valve is used in combination with the water meter and ADO M-Bus module for remote reading, the valve can be configured to close after a certain quantity of water has passed through the water meter, making it particularly suitable for use in hotels, weekend settlements or anywhere else where water or gas are charged by pre paid system.

ADO Software

Parallel to development of remote reading devices, INSA has developed a number of software applications for data collecting and processing as well as service software for ADO devices configuration and ADO system maintenance.

INSA ADO system for remote reading includes following software:

1. ADO MANAGER
2. ADO READER
3. ADO OPERATOR
4. INSA VALVE UTILITY
5. ADO GSM 2 UTILITY
6. INSA MAILER
7. INSA AMR WEB APLIKACIJU
8. ADOM SERVICE
9. ADOM OVERVIEW

ADO MANAGER software for PC is used to create databases and data download from handheld terminals used for reading. ADO MANAGER software has options to export the read data to standards formats which Collection and Billing Software supports (txt, csv, xml).

ADO READER software for handheld terminals is designed for direct reading of water meter status. Upon successful reading, the data are stored in internal memory of the device so that they can be later transferred from ADO READER software to PC via USB connection.

ADO OPERATOR is an auxiliary software implemented in ADO READER software and is used for parameterization of wireless ADO devices and ADO RF Valves.

INSA VALVE UTLITY is a software designed for desktop (laptop) computers. The main purpose of the applications is to set the parameters of RF valve. It is very similar to the ADO OPERATOR but with many more advanced options for complete access to all parameters of the RF Valve.

INSA GSM 2 UTILITY is a PC (laptop) software designed for programming and configuring ADO GSM2 devices via IRDA transceiver connected to USB port.

INSA MAILER is software designed for desktop computers and is used to pull out the status from e-mail messages containing statuses sent by ADO GSM PULSE i ADO GSM2 devices. INSA MAILER pulls out the data from e-mail server to a computer and creates (locally, on the computer hard drivea) the database. The software enables the overview, report creating, flow chart creating and data exporting to some of standard formats which the Collection and Billing software supports (txt, csv, xml).

INSA AMR Aplication

INSA AMR Web Application is a complete software application for automatic meter reading via ADO wM-Bus and ADO GSM2 devices. Read data are stored in the Cloud. INSA AMR Web application is web oriented and accessed from the browser on a computer and therefore there is no software installing and the data can be accessed with User name and password from any computer containing the browser and Internet connection. The application provides an overview of the read data, search by user, the consumer code, address, etc., consumption overview in the form of statistics or charts. The application provides the data export to some of standard formats supported by Collection and Billing software (txt, csv, xml).
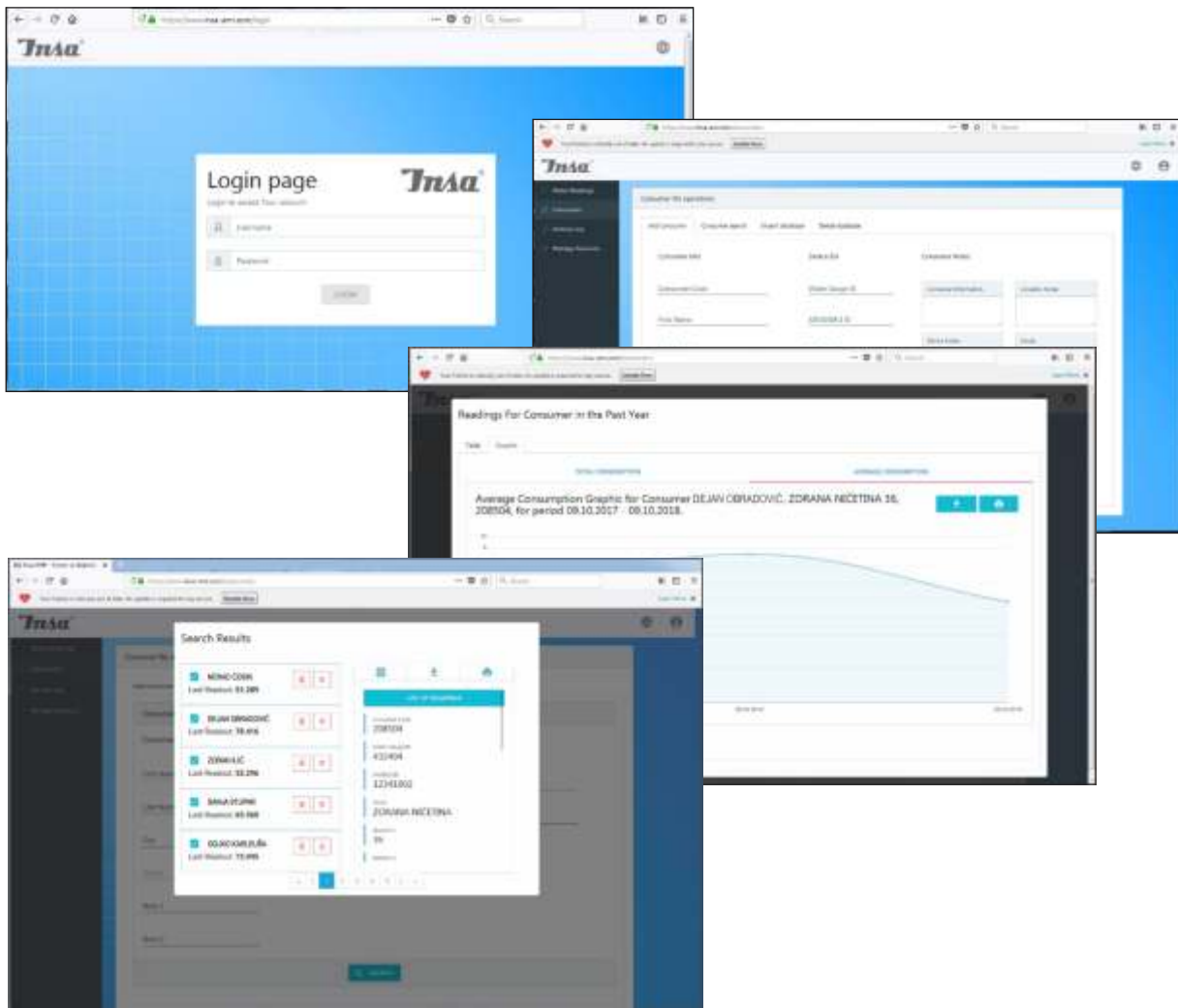
INSA ADO M OVERVIEW

INSA ADO M SERVIS is a PC application designed to configure wired M-Bus networks. The application offers fast search of slave devices on the network and parameter configuration for each module on water meters (configuring primary and secondary address, liters per rotation, multiplier and status counter).

INSA ADO M OVERVIEW is a desktop application designed for measuring reading via M-Bus networks. The application provides creation of database with readout statuses as well as speed reading of all devices on the network in real time.
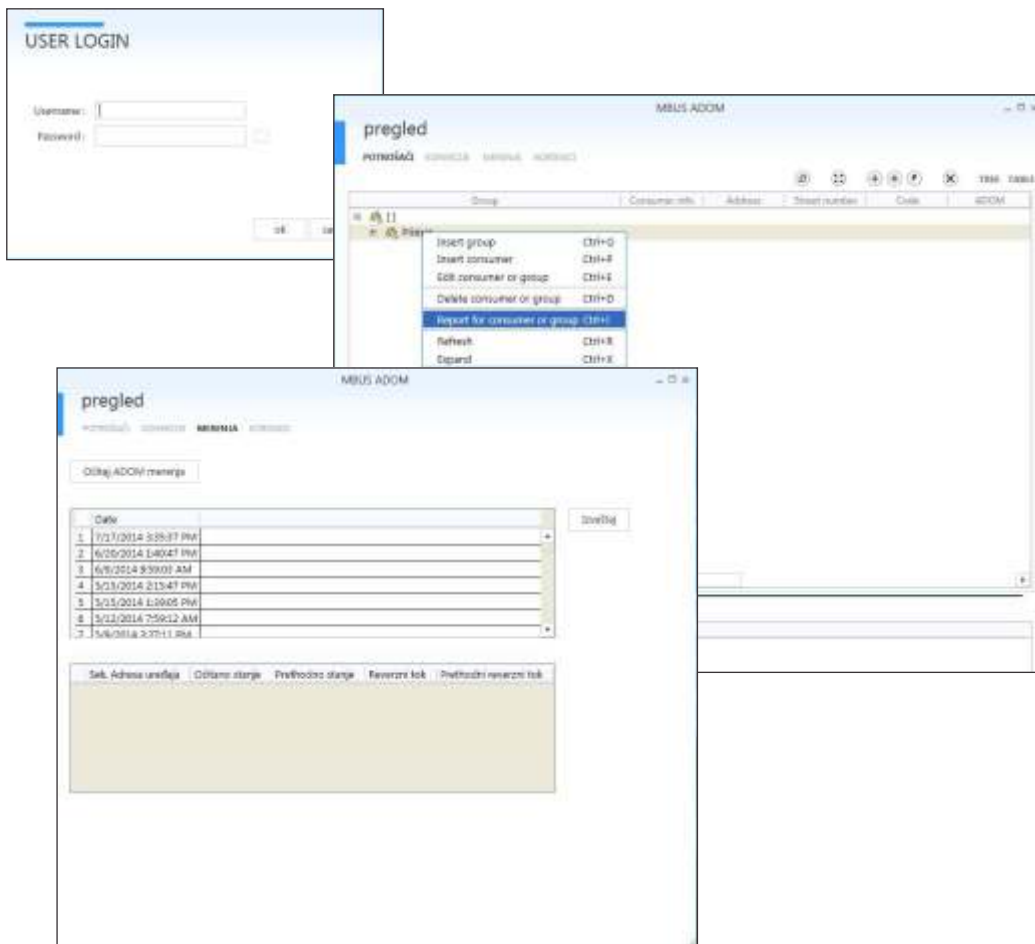
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1950. The year that Insa was established and was named simply "Clock factory", with the aim to produce mechanical alarm clocks

2003. Insa applied for quality management and gained ISO 9001:2000 certification

2010. Insa has overhauled its calibration lab for water meters by refurbishing the existing lab, installing new (calibration) equipment and gaining the ISO 17020 certification

Insa's AMR has become a reality and customers, all over the world, are now enjoying its benefits.

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