



SYNDIS AQUA

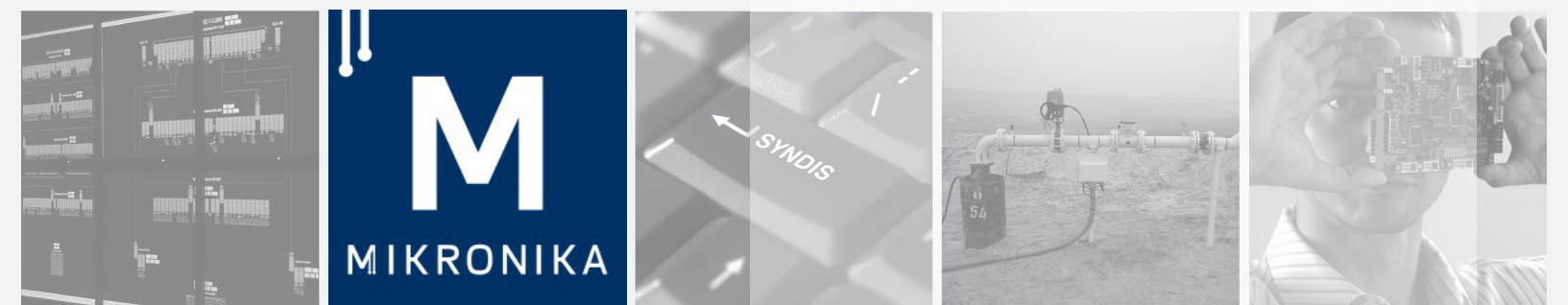
mine drainage
management system

SYNDIS RV AQUA provides effective environmental protection, as well as minimization of operational costs.

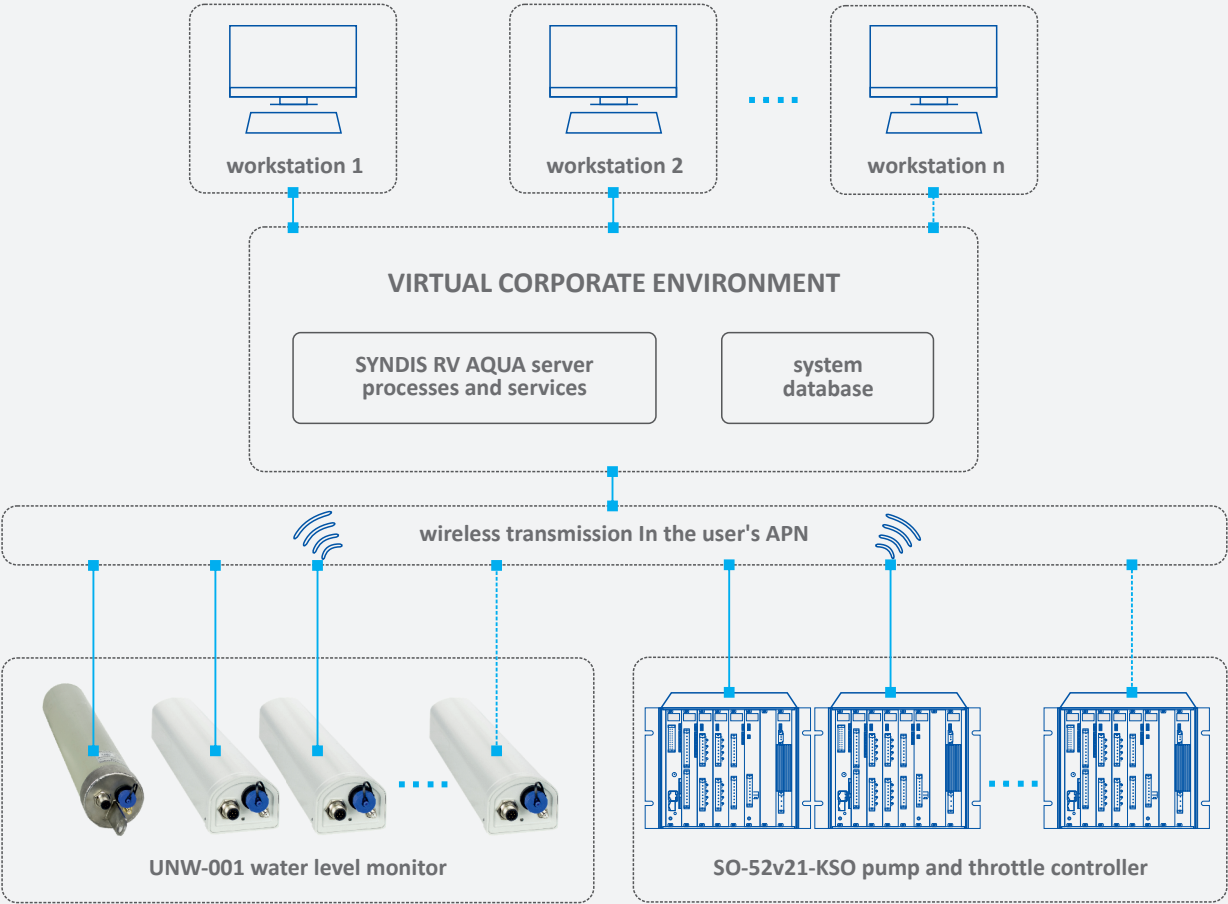
SYNDIS RV AQUA was designed to optimize drainage management in mines. It is a necessary and universal tool for water resources management and groundwater protection in mining areas. The system supports extensive environmental protection in surface or underground mining, and also prevents ecological disasters. The system also helps to minimize the maintenance costs of pumping units and other drainage components and simplifies the environment data reporting.

The system enables remote measurements of the groundwater table, regulation of a throttle and enables complex data processing supported by integrated processing software.

The system consists of gauges for groundwater level measurements, wireless transmission, devices providing effective control and management of pumps operation and monitoring of chemical composition of water. The system furthermore includes the reading and processing software for data measurements purposes which allow for optimal drainage management and environmental assessment.

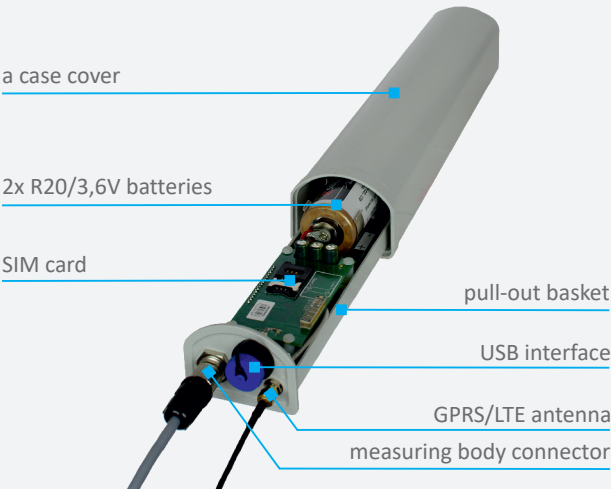


The structure of the system



Water Level Measuring

Water Level Measuring is performed by means of an innovative UNW-001 piezometric device with independent power supply and low energy consumption. The device is available in two options - the basic one - to be installed in measuring wells and the second with high-level protection - for prolonged submersion. The measurement data are transmitted over the GPRS network. Data transmission is distinguished between two different types of transfer: the monitoring regime (several times a week), and the disaster prevention mode (every few minutes).



The inside view of a internal water level monitor UNW-001 type with independent power supply for establishment in measuring wells.



Water level monitor UNW-001 with high-level protection for prolonged submersion.

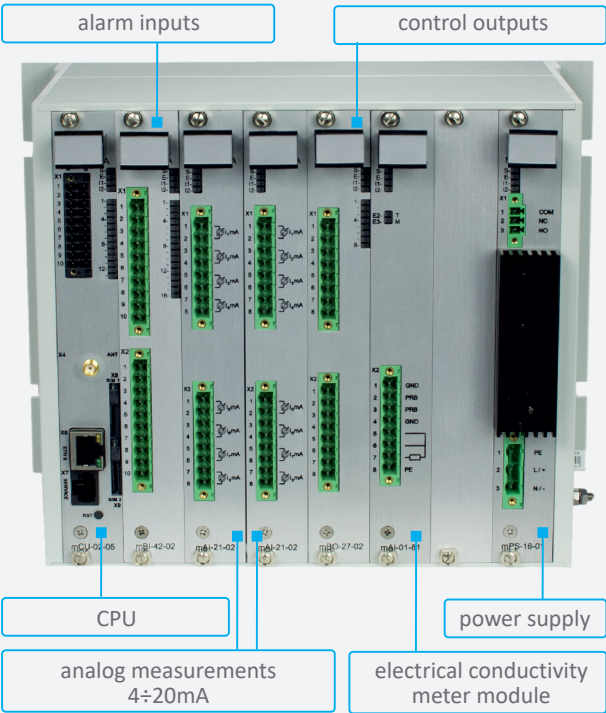
Technical specifications UNW-001

PARAMETERS	VALUES	NOTES
internal power supply	2x lithium batteries 3,6V (R20)	-
external power supply	power supply unit 7,2÷9V/2A DC	-
energy consumption in standby mode	<50µA·h	-
energy consumption - sending 1 SMS	0,35mA·h	average consumption
energy consumption - GPRS mode	2,4mA·h	average consumption, max. 12 SMS/24 hours
continuous mode on demand	30 days	average consumption
number of measurement inputs	4	measurement of the current loop 4÷20 mA
number of binary inputs	2	active on switch to ground or breaking
operating temperature range	-25°C to 60°C	PN-EN 60870-2-2 class C2, advanced
relative humidity	5÷100%	PN-EN 60870-2-2 class C1, advanced

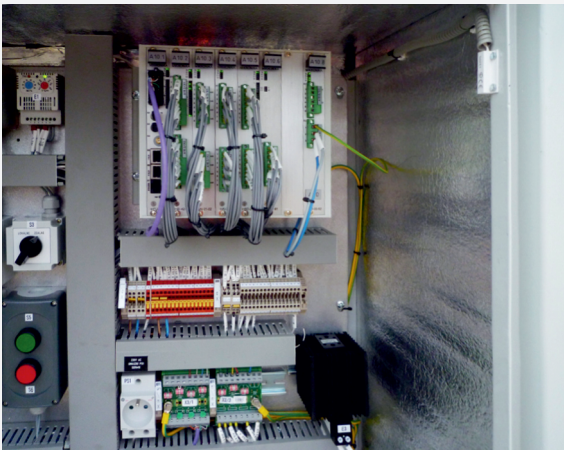
Management of pumping units

Management of pumping units is carried out by a specialized SO-52v21-KSO controller according to the defined algorithm, maintaining assigned groundwater table or specified dynamics. Drainage system management can be performed remotely from the Center according to the optimized algorithm. Optimization takes into account the required operation time of pumps, the cost of consumed energy and the pump operating point, determined by the dependence of the pump efficiency on the force of the current. The water flow is regulated by means of remote control throttles. The controllers are equipped with measuring modules to work with conductive and temperature sensors, measuring conductivity, pH level and temperature of pumped water.

Conduction constant of the probe can be parametered. Thanks to that it is possible to measure the level of chloride ions for different concentration ranges. The controller is installed in the weatherproof cubicle. Measured and preset parameters, such as the specific water weight and total salinity are transmitted to the system server, making it possible to terminate the pumping operation immediately in case of drainage water pollution.



The SO-52v21-KSO controller for pump management with the conductometer service module



Control pump cubicle with SO-52v21-KSO controller

Controller's technical specifications

PARAMETERS	VALUES	NOTES
power supply	220/230V AC/DC	input voltage range 120÷310V AC/DC
number of analog inputs	16	current inputs 4÷20mA
number of binary inputs	16	input voltage 24V DC
number of control outputs	8	0,5A/230V AC
number of conductivity measurements	1	interaction with the probe of a constant K = 0.1; 1.0; 10
number of temperature measurements	1	interaction with the probes: PT100, PT1000, Ni100
built-in modem	yes	GSM/GPRS/EDGE/HSPA+/UMTS, LTE modem
number of SIM card	2	independent operation in the networks of two different operators
object interfaces	yes	Ethernet: TP100; 2xRS-232; 2xRS-485; 1wire
operating temperature range	-25°C to 60°C	PN-EN 60870-2-2 class C2, advanced
relative humidity	5÷95%	PN-EN 60870-2-2 class C1

The SYNDIS RV AQUA system characteristics

SYNDIS RV AQUA software integrates all equipment and other functional elements of the system. The software is installed on the master and backup servers. Communication with object devices is carried out in the GPRS standard, in "the user's APN" (Access Point Number).

The measurement and control devices monitoring goes on-line. The system is able to read data from other devices and systems, such as: protections, flow recorders, states of switching devices in bays, ,controllers and others,. Those data are transferred to database and the events are logged in the event log. The water level data coming from UNW-001, together with pump operation and water salinity data coming from SO-52v21-KSO are recorded to the database as well.

Built-in algorithms allow to send warnings and alarms to the dispatch centre. What is more, the SYNDIS RV AQUA system constantly monitors operational serviceability of the pumps. The built-in algorithm indicates pump degradation and signs of an increased accident probability. Selected pumps are subject of technical inspections without further delay.

In addition, the system optimizes operation of the entire installation by means of the throttle control that regulates the flow. As a result, the pumps work within the optimal range of operating performance. The monitoring functions optimize the drainage process in accordance with the criterion of the preset water level, energy saving and efficiency. Pump failure prediction function considerably improves the efficiency of maintenance of the pumps engines, pumps as a whole and the power cables.

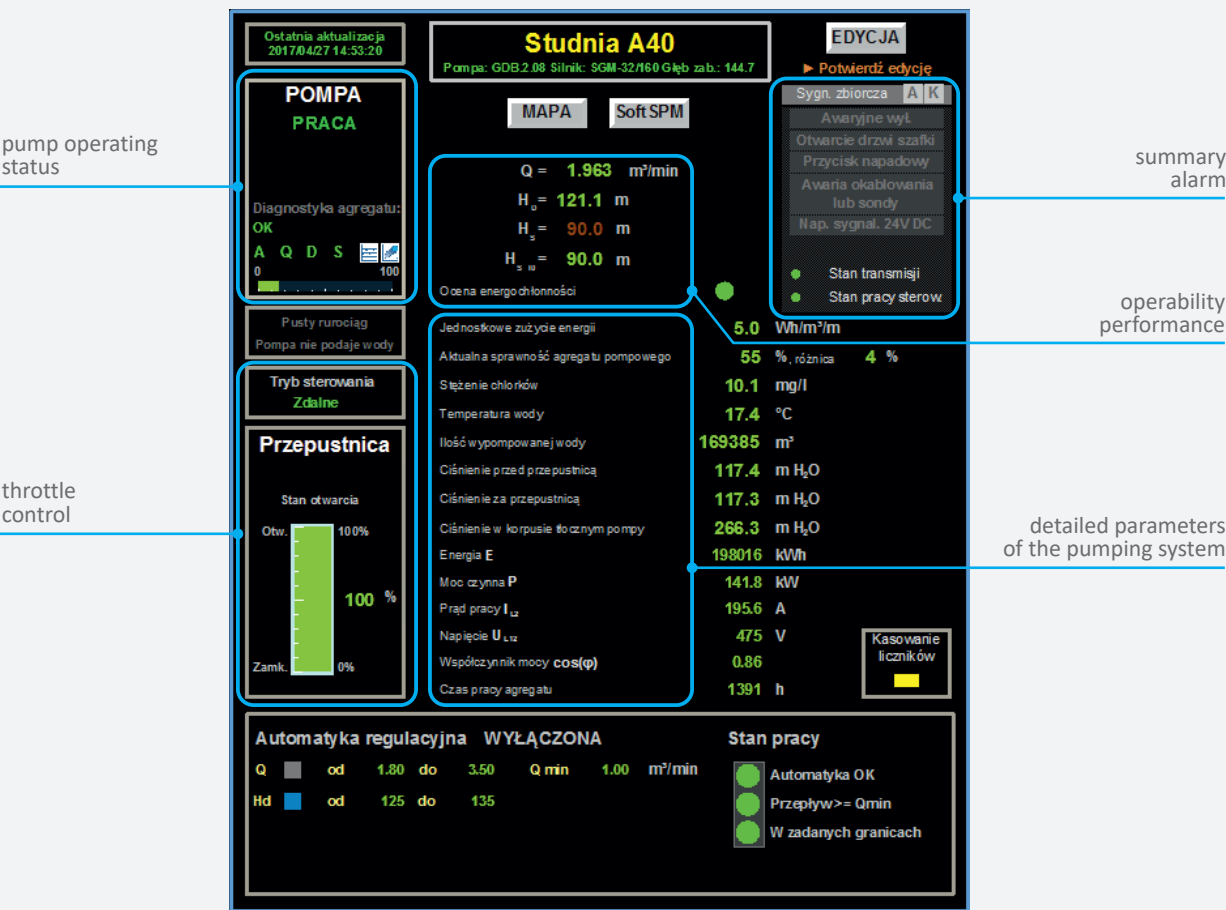


Example screen

The screen shows the status of the measurement points in the SYNDIS RV AQUA, there is also the open diagnostic application window, and windows, displaying status of the selected pump and efficiency process.



Display of a status of the selected pumping aggregate



Advantages of the system

The use of SYNDIS RV AQUA system in surface mines brings important advantages in limiting costs related to:

- difficult and expensive on-site water level measurements directly
- manual throttle control
- long and complex data processing without proper IT support

Besides, the system provides tangible benefits in maintenance and restricting unnecessary repairs, focusing on the elements that really need tech support.

Reporting framework can be configured in the form of thematic summaries, detailed tables and graphs, along with comments and additional description, depending on need. Reports can be generated on request or periodically, which simplifies legally required environment reporting.

The system hardware is prepared for the operation under extreme environmental conditions and in the open air, as well as can withstand great changes in temperature and high dust levels. The measurement systems operate at humidity of 100% and are ready to be installed in closed wells without air exchange.

So, the SYNDIS RV AQUA system confirms it can be applied in underground and surface mining. At the same time, it is possible to use its individual components to create a distributed system for analysis of water chemical composition and water level monitoring with the purpose of determining the flood threats probability.

The system's capacity

- the pumps and throttles automation and control, the internal and external piezometers monitoring
- interaction with the operating systems of deep pumps, e.g. SoftSPM
- interaction with the systems of supervision, control and support, e.g. SYNDIS
- interaction with water discharge monitoring systems, e.g. HYDRAS 3
- interaction with pumping stations control systems, e.g. OSA-2
- automatic data archiving
- configurable report templates
- easy and multi-level editing of maps and objects