



RESYS

Wireless communication system
for underground workings

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Project implemented by 2RHP company in cooperation
with the Central Mine Rescue Station, Joint Stock Company (CSRG S.A.)

Presentation of work of RESYS system in KWK Piast - Ziemowit, Ruch Ziemowit
Lędziny, 1 February 2019

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The **RESYS** system combines advanced technical and software knowledge of **2RHP** team with daily practice and experience based on rescue operations of specialists of the Central Mine Rescue Station.

It is a response of high-tech to real communication needs of mine rescuers during rescue actions conducted in extremely difficult conditions of mine workings.

The **RESYS** system also means effective, safe and wireless communication between miners in underground workings.

RESYS has been designed and built according to rigorous rules for intrinsically safe devices used in conditions of potentially explosive atmosphere ie. at risk of an explosion of methane/air and/or coal dust mixture.

GENERAL SPECIFICATION:

Waves propagation

RESYS has been designed and made considering specific condition of waves propagation in all underground mines and its approved intrinsically safe construction is especially dedicated to workings exposed to the potentially explosives atmosphere.

Noise

Headphones and a microphone used for voice communication are adapted to high noise conditions.

Mobile backbone network

Galleries/workings in underground mines are characterized by a great variety of conditions due to the needs of wireless communications. The RESYS system covers these requirements because of easy and flexible adaptation of nodes of wireless network to existing local conditions and rescue purposes.

Optical fiber

The rescue network can use/or co-use existing optical fiber for data and voice transmission.



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RESYS DEVICES INCLUDE:

1. Personal Communicators PC1.0, - personal equipment of a rescuer/miner

- Headphones casing – assure hearing protector with high attenuation, activated by means of one button, automatically logged to the network,
- Duplex communication (bidirectional at the same time)
- Two versions of microphone sets is offered: built-in full face mask of breathing apparatus or mounted to helmets for using in respirable atmosphere.
- High quality loudspeakers – adjustable reduction of outside noise reception.
- A loudspeakers with external noise cut-off.
- A dedicated high-gained antenna
- Battery replaceable in MI zone
- Weight of device ready to work comes to 650 g, where the battery weighs 140 g. Battery capacity of 3,000 mAh allows approx. 12 hours of continuous work.





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1. Personal Communicators PC1.0,

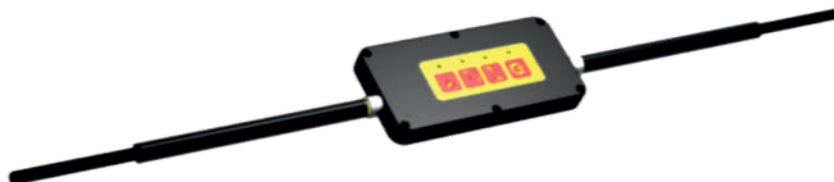




RESYS DEVICES INCLUDE:

2. Repeaters REPI.O, - items/elements forming nodes of a wireless backbone network structure

- Provides an easy and flexible network design/construction on an ad hoc basis/needs - light and functional intrinsically safe casing,
- Dedicated high-gained antennas
- REPI.O elements allow to keep a track and position of rescuers in relation to the specific repeaters
- Battery replaceable in MI zone
- Weight of the repeater ready to work comes to 440 g of which the accumulator itself weighs 140 g with capacity of 3,000 mAh, which allows for 15 up to 20 hours of work





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2. Repeaters REP1.0





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RESYS DEVICES INCLUDE:

3. MI base unit - equipment of a Rescue Operation Manager underground

- Duplex communication between five teams and a rescue operation manager underground and connection with a rescue operation manager in the headquarters
- Applications tracking on-line parameters of devices used in an action: communicators, repeaters, external devices (monitoring of bodily function)
- Software of MI base unit enables fast upload digital maps of mine. It makes possible visualization on the monitor/screen in commander center of live stream transmission of all movements of rescue teams ie. to keep a track and position of rescuers in relation to the specific repeaters
- Sending of voice messages replayed at the same time in all personal communicators
- Audio recording and recording of all data during the course of rescue operation (parameters of networks, devices, alarms, sent text messages)
- Communication with the surface via the mine's infrastructure (local telephone network or Ethernet)kopalni (sieć telefoniczna lub Ethernet)





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3. M1 base unit—equipment of a Rescue Operation Manager underground





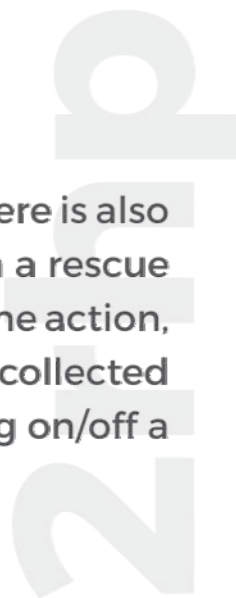
RESYS DEVICES INCLUDE:

4. Mediaconverters MCI.0

element of a wired optical fiber network. Alternative network - replacement of the radio network with optical fiber means faster transmission (shorter delays) and lower energy consumption.

5. Application

equipment of a rescue operation manager on the surface (there is also a version for the headquarters) allows to be connected with a rescue operation manager underground and to track the course of the action, including location of rescuers/miners. It also displays data collected through the network e.g. device battery condition, switching on/off a microphone.





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5. Application

Screen visualization of rescue operation – MI base unit working in Surface Commander Center/





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Ruch Ziemowit Łędziny, 1 February 2019 (in Coal Mine Ziemowit)

Conditions in galleries where an action is carried out



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**MI base unit in Fresh Air
Base (FAB)**



Gallery No. 1



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Ventilation gallery



Chamber - Station of Main Pumps



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Pipe gallery



Localization of simulated fire
area of a rescue operation



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