



# Underground Communications Solutions



# ABOUT US

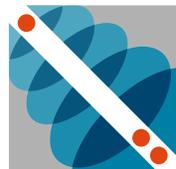
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## SIGMA – UNDERGROUND COMMUNICATIONS SOLUTIONS

SIGMA has provided communication solutions to more than 1000 underground mines and tunnels in the 5 continents. We contribute with innovation to the mining industry, backed for many years of experience installing communication systems, at a low cost and a high performance. Furthermore, we provide added value by integrating solutions concerning security and productivity on state-of-the-art communication platforms that grant your Company with a clear competitive advantage.

From the begging SIGMA has developed permanent innovations to its underground communication systems, to provide the mining industry and confined spaces with the most advanced technology, from the continuous re-design of its Leaky Feeder networks, to the design of DRS networks, that allow multiple wireless signals to be sent underground.

SIGMA started on 2010, based in Concon city, central cost of Chile.



# Underground communications

## SIGMA PRODUCE UNDERGROUND COMMUNICATIONS FOR :

- ✓ Underground mining
- ✓ Vehicular tunnels
- ✓ Confined environments

### UNDERGROUND MINING

Underground mining requires coordinating tasks in each work shift, in the same way open pit mining does with radio systems. For that purpose we have designed a fully reliable communication network, easy to install, easy to manage and modify. On the other hand, it is a system especially robust for harsh mining environments.

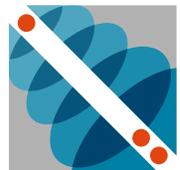
### VEHICULAR TUNNELS

The new vehicular tunnels include advanced safety systems. For that reason we have designed a communications systems that allows various signals to be entered and broadcast wirelessly within the tunnels (FM music, BREAK IN, VHF, UHF, TETRA, P25, Cellular, etc.)

### CONFINED ENVIRONMENTS

Other practical purposes for our communication networks are:

- ✓ Water tunnels, for its construction coordination
- ✓ Service tunnels. There are several underground services below cities, such as mains network, underground railway, etc.
- ✓ Big ships.
- ✓ Wide underground levels, underground parking, and every closed space without any surface connection.



# Added Value Systems

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SIGMA has extensive experience achieved through presence in the large number of clients it has provided with its communications solutions, located on 5 continents in its long period of existence. This has allowed constant innovation in its communications solutions.

This has also allowed us to innovate in value-added solutions, according to the requirements requested directly by customers. Among the most relevant solutions can be summarized:

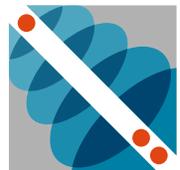
## SIGMATION SERVER

SIGMATION server was specially designed by SIGMA to host its value-added solutions, acts as an interface between SIGMA's communication systems and Ethernet data networks, allowing remote control / diagnostic from underground to be integrated into the customer's data network.

The SIGMATION™ server allows operate a wide range of solutions for underground mining, its fundamental feature being the communication with underground devices to obtain data or control. Coordinate the information with underground devices to send the data directly to its databases and graphic presentation.

SIGMATION incorporates a web interface, by means of connecting the server to the customer LAN. It includes access to application management software and data and visualization, including a free and editable database.

With the SIGMATION server the development options are limitless. Through SIGMA communication network and the interface software, it is possible to provide solutions such as:



## Added value systems

### SIGMATION SERVER:

It is a SIGMA built server, ready to host added value solutions through the SIGMA communication network.



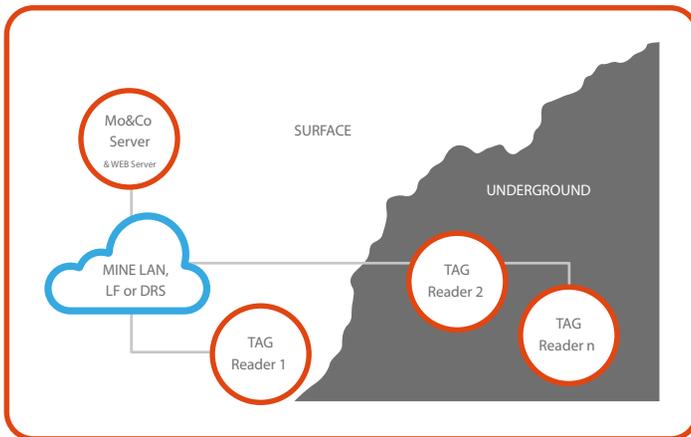
### REMOTE DAGNOSIS:

It is an application that monitors and controls the SIGMA communication network.



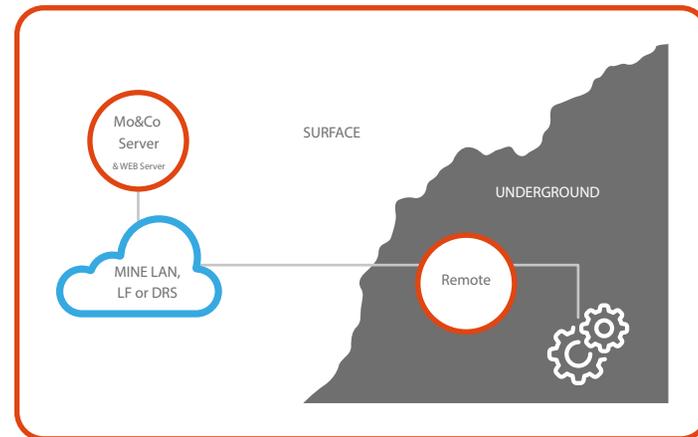
### TAGGING:

It is an application that allows to detect personnel or vehicles.

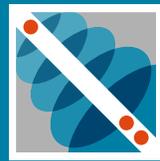


### EQUIPMENT CONTROL AND MONITORING:

It works by means of data gathering in order to control ventilators, gas detectors, electrical substations, water levels or pump generators activation, etc.



Chile 



**SIGMA**

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