

**FHF Bergbautechnik**  
Mine automation and communication systems

**CROUSE-HINDS**  
SERIES



**EATON**

*Powering Business Worldwide*

 **ATEX**  **IECEx**  **PCT**



# Part of our wider solution for hazardous environments

**MEDC**

**Oxalis**

**Gitiesse**

**HERNIST™**

**Sonix™**

**Yuhua**

**FHF**

## **PA / GA**

Designed, engineered and manufactured according to individual project specifications and industry regulations. The Sonix™ system uses the latest in digital technology and can be integrated with a wide range of Eaton products to ensure the integrity of your assets in even the most demanding of environments.

## **CCTV**

Cutting edge technology from our market leading brands of HERNIST™ and Oxalis.

With the widest range of camera stations and system solutions from a single manufacturer, we have the products and experience to meet today's demanding surveillance and security needs.

With products available that are explosion protected or weatherproof, analogue or IP, fixed, dome or PTZ, our experience and proven reliability can meet your specification requirements.

## **Signalling and alarms**

Our MEDC and FHF product lines offer a wide range of products specifically designed for harsh environments where there is a risk of explosion for both onshore and offshore applications. This range of products including manual activation, visual and audible alarms, and loudspeakers, can be connected to IMCOS or Sonix™ delivering the best combination of performance and safety

## **IMCOS**

One of only a few systems in the world to have seven different type approvals.

IMCOS provides the solutions you need both Onshore and Offshore. The following applications demonstrate the ability to provide a single solution.

With IMCOS and our latest developments in technology, we are able to provide a single network which provides reduced cable architecture. Our LAN systems are able to share a highway of information and resources, interlinking video, voice and data with our VoIP telephones, IPTV streaming, CCTV, PA/GA and Intercom systems through one fibre or copper backbone.

## **Mining automation and communications**

Our FHF-BT product range has over 100 years of experience in mining applications. Today the team delivers intrinsically safe turnkey automation and communications solutions on a global basis. Our solutions based offering includes shaft signalling and communications, loudspeaker and conveyor belt control, data transmission, radio systems and various automation systems.

## **Telecommunications**

Whether a traditional analogue, digital, VoIP or Hybrid telephone system is what you require, we can provide the solution you need with our IMCOS PABX system. Together with a wide range of telephones we can provide standard, weatherproof, explosion protected and IP phones.



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A photograph of a tunnel under construction. In the foreground, two yellow hard hats are placed on a concrete surface. The background shows a dark tunnel with a concrete lining and a series of lights at the end, creating a sense of depth. The text "Our history" is overlaid in a large, yellow, sans-serif font.

# Our history

**Eaton's FHF Bergbautechnik (BT) was founded in 1897 under the name of Funke + Huster. It has a continuous history of engineering excellence in Germany and other countries worldwide. With over 30 years of international experience in the worldwide market, Eaton's FHF BT range is perfectly equipped to undertake complete turnkey projects for all types of underground and surface mines.**

The Ex I technology covers the fields of shaft signalling, communication, control systems, radio systems as well as data transmission and automation systems.

The team gained their experience under the harshest conditions: **underground in the mine**. Even then they were searching for innovative developments. At a time when it was still commonplace to install telephone devices in wooden cases, Funke + Huster developed the first telephone set in a waterproof metal box which proved to be very well suited for underground usage. Funke + Huster continued to expand the company's range of telephone devices and many were considerably smaller and lighter than other units available.

Funke + Huster also played a significant role in automating the technology for the mining industry. The mine control stations they developed to register, check and control the mining operations. Automation and signalling technologies were Funke + Huster most significant work.

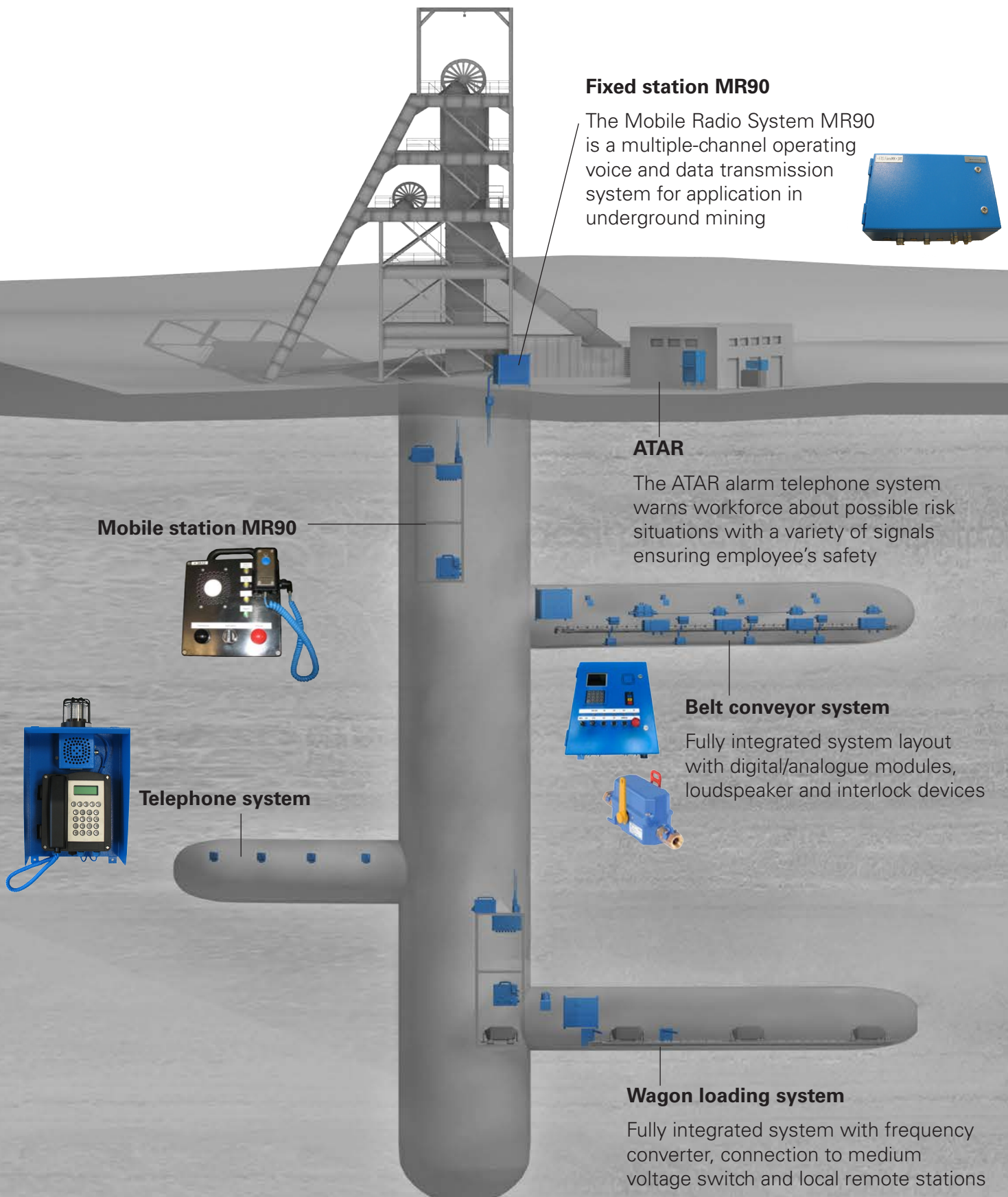
Eaton acquired FHF BT in 2012 and the range continues to provide solutions to customers worldwide.

FHF BT can provide solutions across the underground mining industry including coal, diamond, gold, copper, potash and nickel.

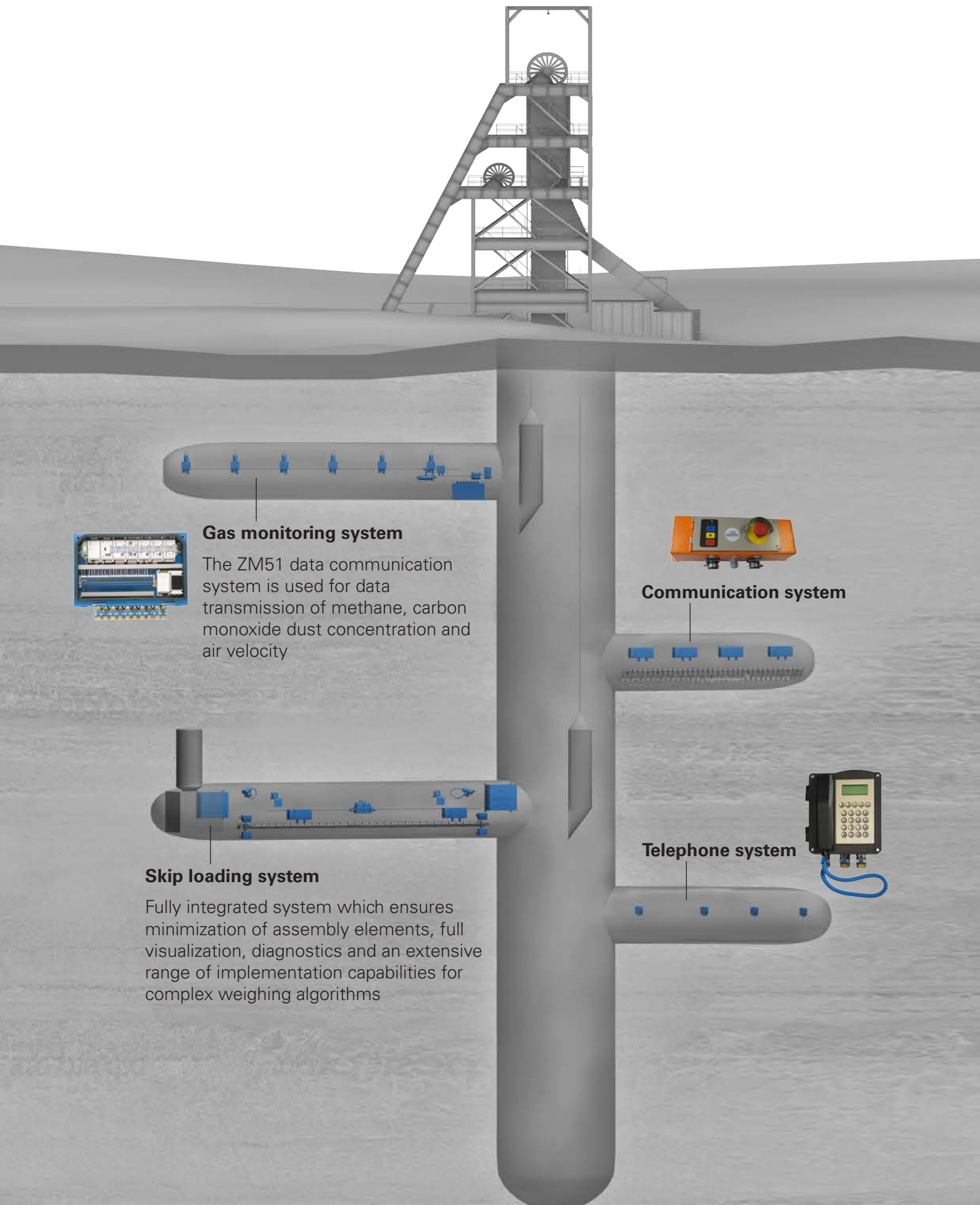
FHF-BT products are manufactured to withstand harsh and hazardous atmospheres including explosive, high humidity, dust and water environments. We continue to develop our systems and devices to reach optimum results at the lowest energy ratings.



# Making mine site operations safer and more productive



Customised automation and communication solutions help you improve mine safety and enhances your mining operation



#### **Gas monitoring system**

The ZM51 data communication system is used for data transmission of methane, carbon monoxide dust concentration and air velocity

#### **Communication system**

#### **Skip loading system**

Fully integrated system which ensures minimization of assembly elements, full visualization, diagnostics and an extensive range of implementation capabilities for complex weighing algorithms

#### **Telephone system**



# Services

Reliable processes and equipment are the key components to a profitable working mine. Therefore Eaton deliver high level service support that minimises down time of your operations.

## Technical support

If additional support is required after installation, our service team is available for technical assistance, to resolve any issue effectively and efficiently.

## Service on site

We co-ordinate and ensure service assistance to our installations with our in-house expertise and global network of factory certified service engineers. Our mission is to ensure the optimal performance of your communication and automation systems.

## Spare parts

Eaton offer an expansive range of spare parts in support of our systems. Spare parts are stocked both at Eaton locations and with our global representatives, to ensure optimal availability with the shortest delivery times.

## Claims & returns

For claims & returns please visit our website where you will find a contact form. For returns you will receive a valid RMA number in reply to your submission.

All returns to Eaton must be approved with a valid RMA number. Product returned without this number will be returned at customer costs.

## Customer help line

If you need additional help please contact us for you queries. Our expert team is here to support you. Please review back page for details of your local Eaton support team.



# Project management, engineering and software development

Over the last few decades, the requirements and technologies in mining have changed dramatically. The Eaton team is proud to have contributed to this development.

Utilising our research development department, we are always in a position to react in a flexible and professional manner to the demands of our customers and to set new trends.

Our team of engineers takes advantage of its many years of experience in project planning and the latest software tools such as: WSCAD, EPLAN P8, Siemens Step 7, TIA Portal, WinCC, Multiprog and more.

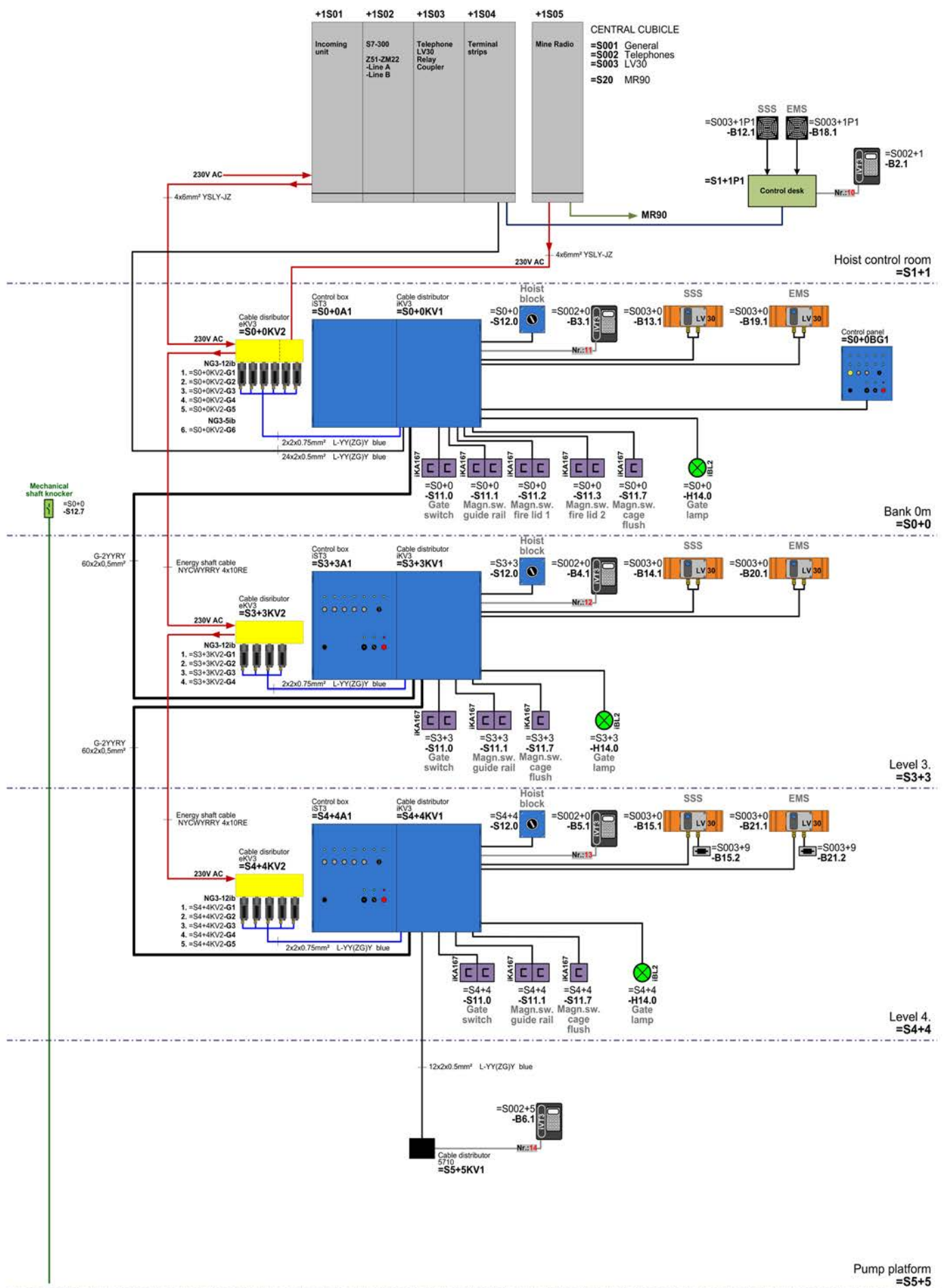
Our practical experience in automation, combined with our extensive knowledge of machine safety, ensures the comprehensive support of our customers in the various tasks related to automation.

Our tried and tested project management with interdisciplinary know-how provides our customers with a personal and time-saving approach, as well as sustainable and reliable results.





# Safe shaft signalling system







### Features:

- Fully integrated signalling (Data/Speech), telephone, shaft radio, CCTV and safety circuit system
- Emergency stop and interlock system with safety coupler (SIL 3) as a redundant system
- Up to two copper cables running down the shaft and used to supply equipment on individual levels
- Hybrid fiber optic cables as an alternative solution
- Independent power supply for the telephone and loudspeaker system (battery backup)
- Fully programmable main plc and scada system
- Robust level boxes out of 3mm stainless steel
- Data communication up to 12/Mbits (Profibus), or 100/Mbits (TCP/IP)

### Benefit:

- High safety level through redundant (two channelled) system
- Stand alone safety circuit according to SIL 3
- UPS function of the telephone and loudspeaker system, in case of mains power shut down
- Programmable to customer needs and local requirements
- Easy to install and commission due to fully pre-tested systems/sub systems
- Easy fault detection due to monitored modules and visualisation in the scada system
- Easy integration into third party system
- Analogue data transmission from the cage/Skip via wireless data communication
- Intrinsically safe explosion protection (I MI Ex Ia I Ma/ I M2 Ex Ib I Mb)
- Rope force measurement / Slag rope monitoring
- Engineering, construction, factory installation, onsite installation and commissioning from one supplier
- After sales service from local subsidiary
- Fault diagnostic via VPN remote access

### References:

#### Main shaft signalling system for men, material transport

SSS, Mine radio, wagon loading system,  
Prosper Haniel Shaft 10, 1250m (Germany)

#### Double skip system for men, material transport

SSS, Mine radio, Skip loading system, CCTV,  
Ural Kali SKRU 3, 600m (Russia)

#### Shaft signalling system for shaft sinking hoist

SSS, Mine radio, CCTV, water pumping, wireless communication for the loading gripper  
Thyssen Schachtbau, Norilsk Nickel, 2050m (Russia)

**Over 150 installed systems all over the world**



**ATEX**

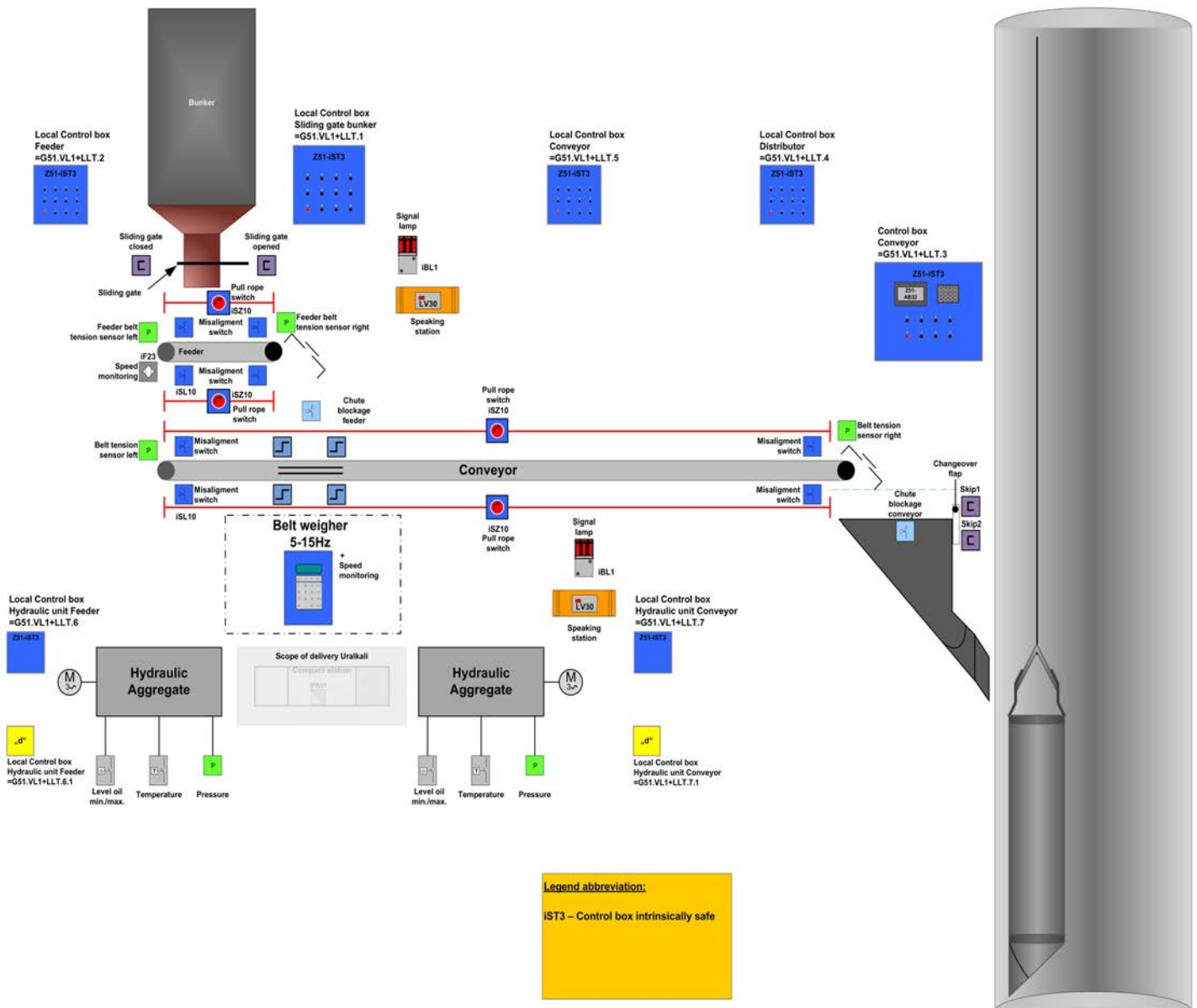




# Integrated skip loading system

## Features:

- Useable together with the shaft signalling system (one controller solution)
- Alternative use of an standalone plc on surface or in the underground
- Fully integrated system (belt scala, connection to medium voltage switch, local remote stations)
- Safety equipment for the belt conveyors (pull rope switches, misalignment switches, blockade switch)
- Fully programmable main plc and Scada system
- Robust level boxes made out of 3mm stainless steel
- Additional Ex switchgears can be supplied





### Benefits:

- Safety circuit according to SIL 3
- UPS function of the loudspeaker system, in case of mains power shut down
- Programmable to customers needs and local requirements
- Easy to install and commission due to fully pretested systems/sub systems
- Easy fault detection due to monitored modules and visualisation in the scada system
- Easy integration into third party system
- Intrinsically safe explosion protection (I MI Ex Ia I Ma/ I M2 Ex Ib I Mb)
- Engineering, construction, factory installation, on-site installation and commissioning from one supplier
- After sales service from local subsidiary
- Fault diagnostic via VPN remote access
- Integration of the belt scales with the controller ensures minimisation of assembly elements, full visualisation, diagnostics and an extensive range of implementation capabilities for complex weighing algorithms

### References:

#### Double skip loading

Skip loading system, belt safety equipment, belt scala  
Ural Kali SKRU 3, 600m (Russia)

#### Double skip loading

Skip loading system, belt safety equipment, belt scala  
Garlyk, 600m (Turkmenistan)

#### Double skip loading

Skip loading system, belt safety equipment  
Friedrich Heinrich Mine, 1200m (Germany)

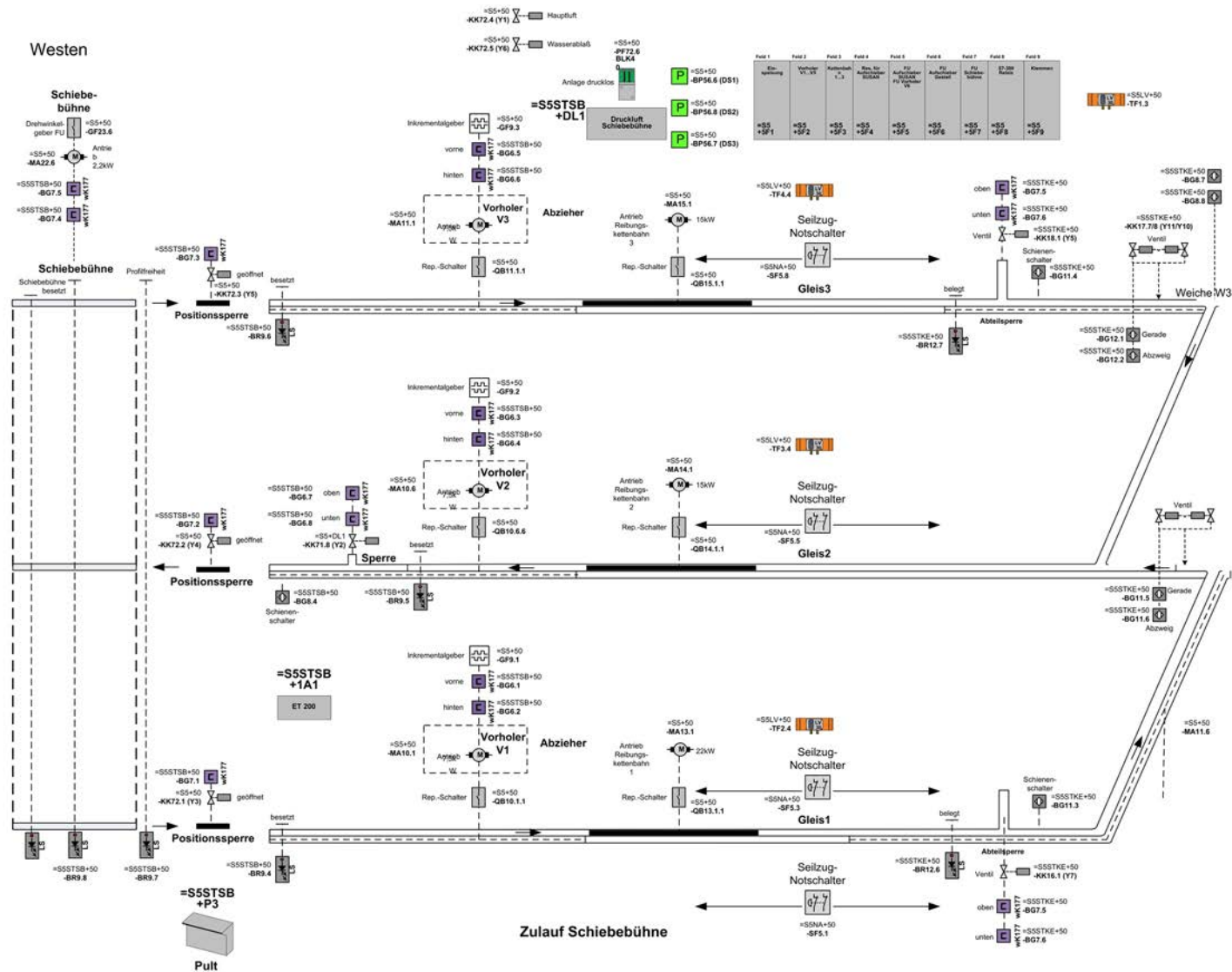


**ATEX**





# Integrated wagon loading system



### Features:

- Useable together with the shaft signalling system (one controller solution)
- Alternative use of an stand alone plc on surface or in the underground
- Fully integrated system (frequency converter, connection to medium voltage switch, local remote stations)
- Safety equipment for the belt conveyors (pull rope switches, magnetic switches)
- Fully programmable main plc and Scada system
- Robust level boxes out of 3mm stainless steel
- Additional Ex switchgears can be supplied

### References:

### Main shaft signalling system for men, material transport

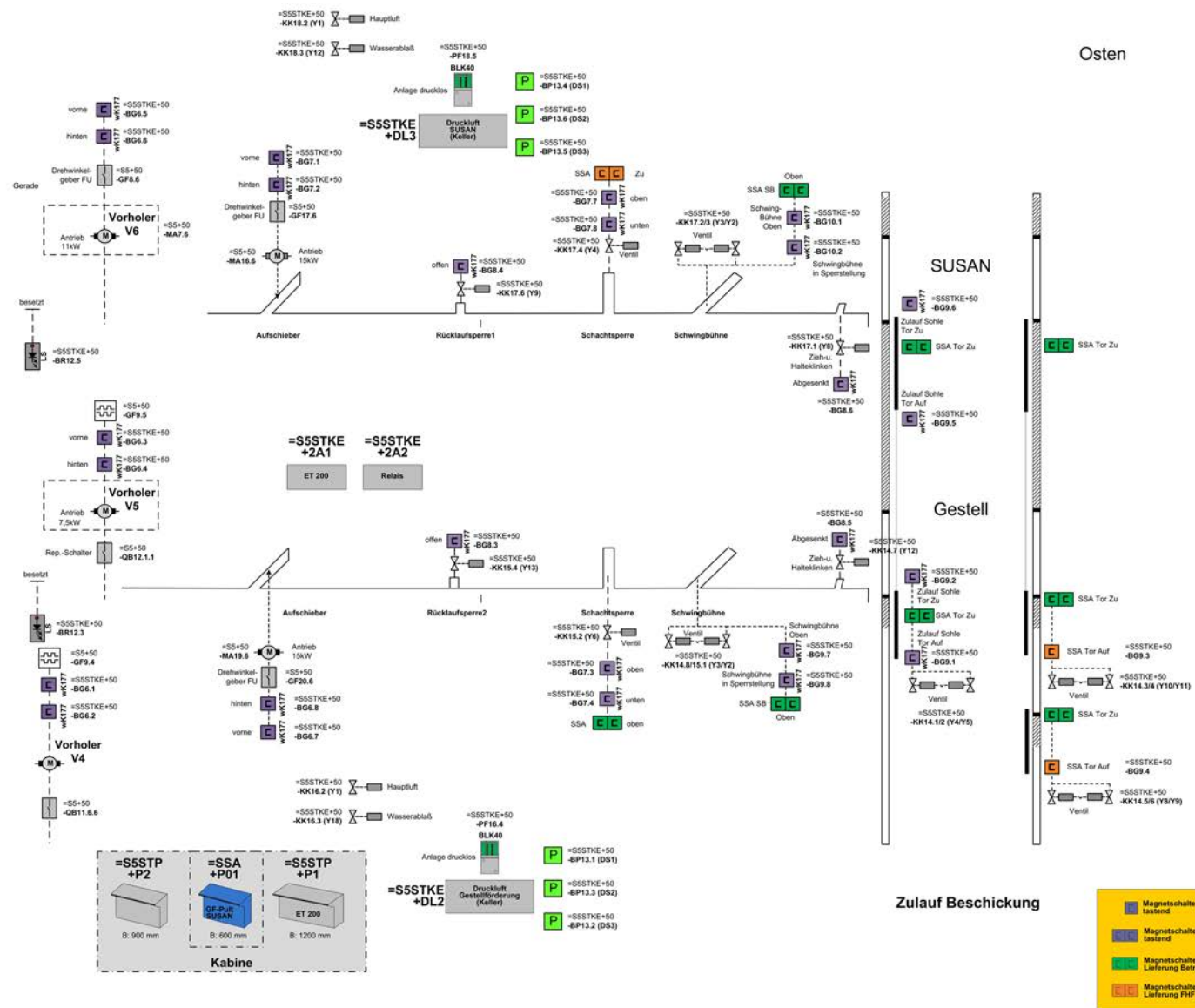
SSS, Mine radio, wagon loading system,  
Prosper Haniel Shaft 10, 1250m (Germany)

### Double skip system for men, material transport

SSS, Mine radio, Skip loading system, CCTV,  
Ural Kali SKRU 3, 600m (Russia)

## Shaft signalling system for shaft sinking hoist

SSS, Mine radio, CCTV, water pumping, wireless communication for the loading gripper  
Thyssen Schachtbau, Norilsk Nickel, 2050m (Russia)



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# Wireless mine radio system MR90

The Mobile Radio System MR90 is a multiple-channel operating voice and data transmission system for application in underground mining.

The radio system is used in order to transmit information from a fixed station to a mobile station and/or persons.

The coaxial cable (leaky feeder) is connected to the fixed station and from this point it is laid out along the communication path.

The vehicle stations and transceivers are coupled to the fixed station with their antenna via the leaky feeder cable.

Even with the long distances of up to 5m between the mobile antenna and leaky feeder cable, trouble free operation is guaranteed in difficult conditions.

The specially constructed microphones and loudspeakers offer an excellent voice communication and high syllable intelligibility.

With the use of the amplifier station it is possible to extend the radio network to a working range of approx. 10km. The non-amplified range is about 2.5km.

The coupling to the following FBT systems offers an area covering communication network and data transmission:

- Intercom and interlock system L112/L120
- Telephones in underground mining with iVT3
- Data transmission systems ZM51
- Compact module Z51-ZM22 for tele control and automation

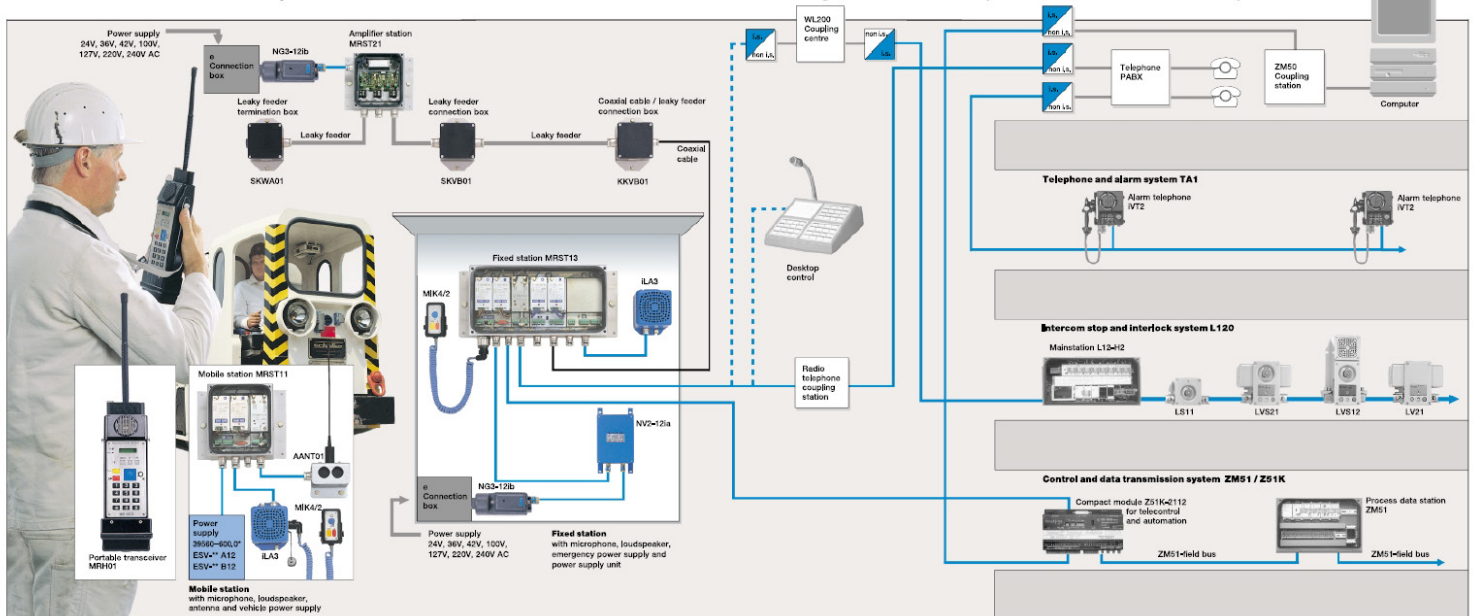
Applications:

- Train signal and voice communications
- Monorail control (remote control of heavy duty winches)
- Wireless shaft communication



## Mobile radio system MR90

The multichannel voice and data radio system



## Features:

- Ex/non Ex functionality
- For use in underground roadways and shaft solutions
- Up to 21 channels
- 100% speech and data transmission
- Self-correcting data protocol
- Up to 64 DI/DO; 16 Analogue transferable inputs
- Automatic controllable transmit power
- Various serial data communication interfaces (Profibus-DP, Ethernet, TTY, Modbus)
- Diagnostic interface
- Various types of antennae available: rope antenna, pole antenna, leaky feeder

## Benefits:

- Extremely high transmission security, through self-repairing data protocol
- Works in shafts with extreme depth
- Can reach great distances by use of remote powered line amplifier in underground roads
- Clear voice intelligibility
- Improvement of workers reachability
- High safety standard with approval from German government authority (Bezirksregierung Arnsberg)
- Use of multiple systems in one shaft

## References:

### Intrinsically wireless communication

MR90 mine radio

Primsmulde, RAG Saar 1850m (Germany)

### Intrinsically wireless communication

MR90 mine radio

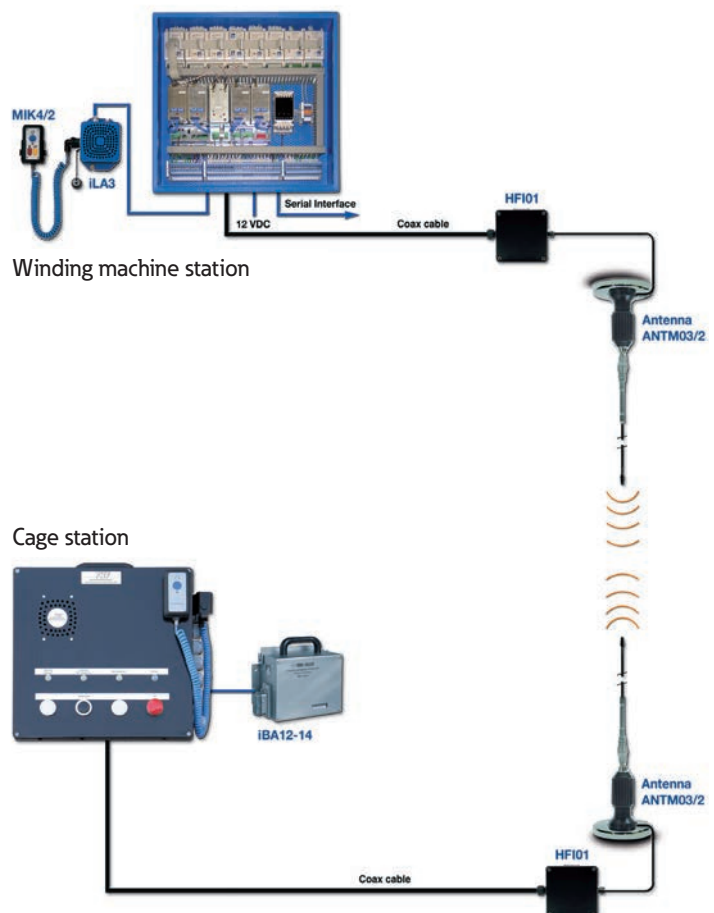
RAG Ibbenbüren 1580m (Germany)

### Intrinsically wireless communication

MR90 mine radio

Krasnoslobotsky, Belaruskali 600m (Belarus)

**Over 150 installed systems all over the world**



**ATEX**





# L111 – Loudspeaker system

## Features:

- Modular system design
- 4-wire system connectable by cable glands or plug and socket
- Up to 40 loudspeakers per section, up to 6 sections cascable
- Speech, signalling and pre start warning
- Battery buffered loudspeaking units
- 32 loudspeaker systems connectable to the WL200 main unit in the control room
- Two integrated loudspeakers in one unit
- High Volume (105 dB) and good intelligibility
- Monitored system line
- Adjustable volume and microphone

## Benefits:

- Easy installation and system setup, due to 4-wire technology
- Long distance reachable to cascable system design
- High reliability and availability
- Continuous communication even in presence of high methane gas (CH<sub>4</sub>) concentration
- Speech transmission into different loudspeaker lines through main unit (WL200)

## References:

### Intrinsically communication system

L111 System

Premogovnik Velenje (Slovenia)

### Intrinsically communication system

L111 System

Seli Oversea (Laos), Xe pian – Xe Namnc

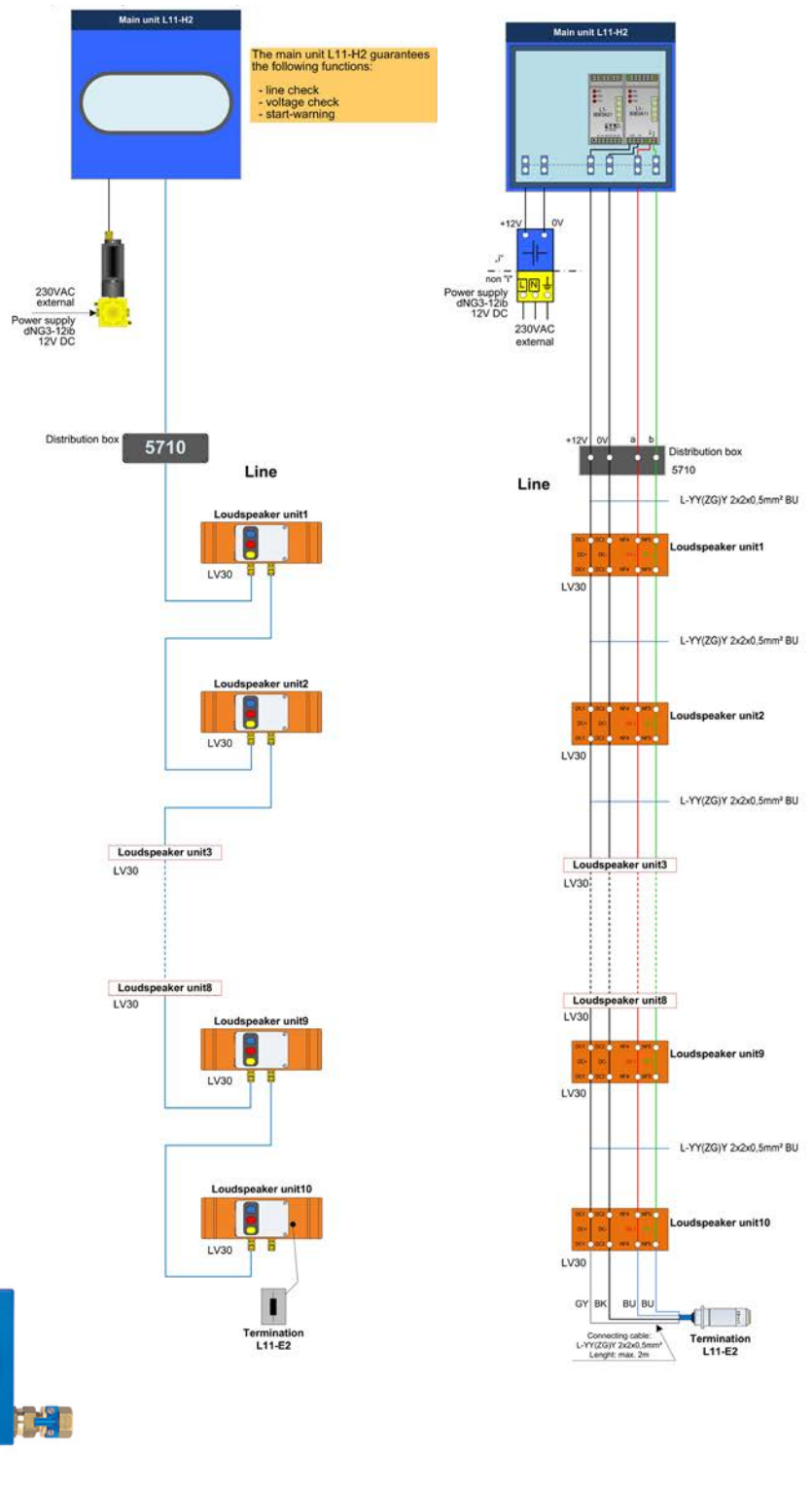
Tunnel project

### Intrinsically communication system

L111 System

RAG Germany

Over 500 delivered systems worldwide



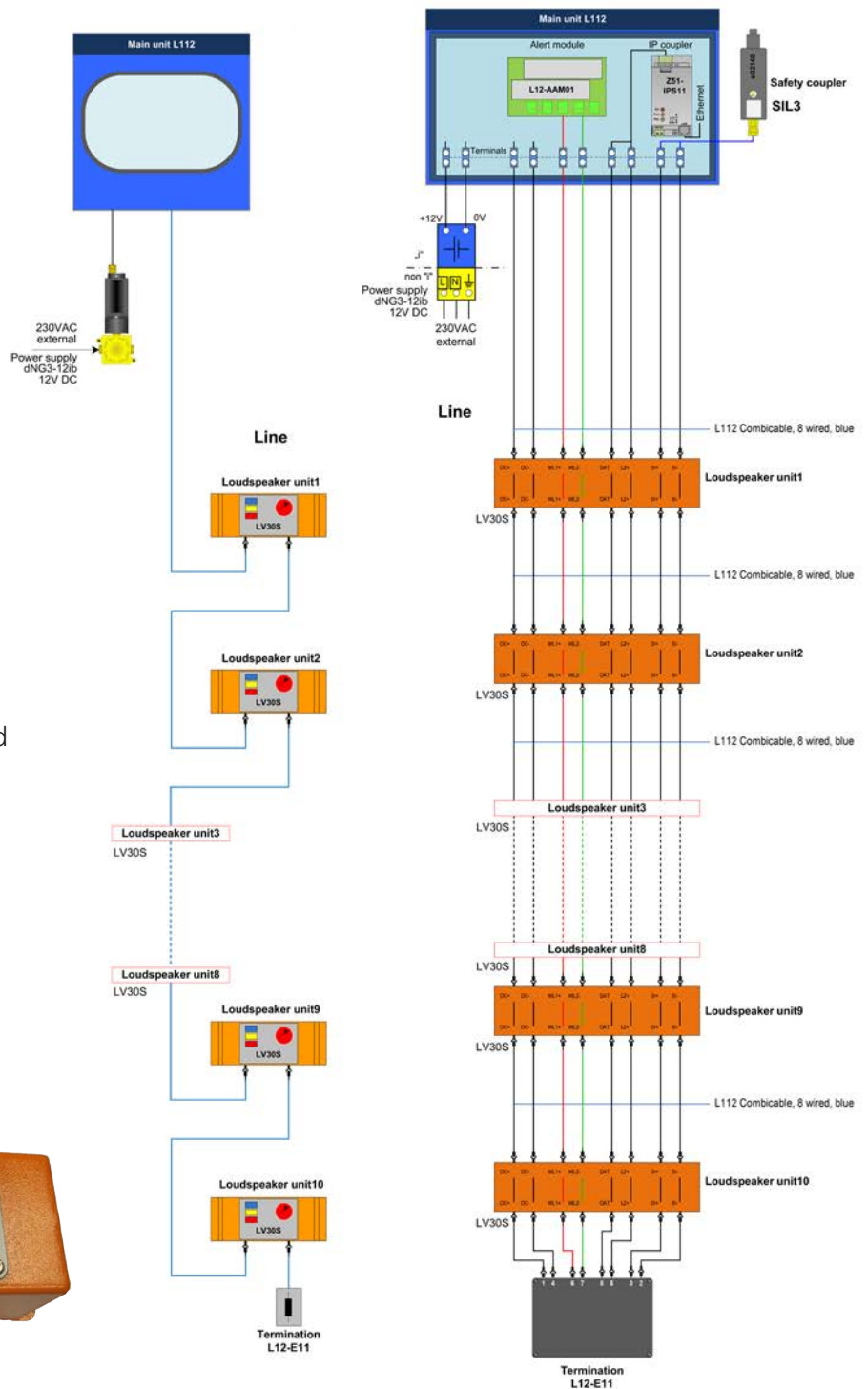
# L112 – Loudspeaker and interlock system

## Features:

- Modular system design
- 8-wire system connectable by cable glands or plug and socket
- Integrated power supply, data communication, speech and safety circuit (SIL3)
- Up to 40 loudspeakers per section, up to 6 sections cascable
- Speech, signalling and pre start warning
- Integrated stop and interlock switches in the LV30s unit
- Integrated encoding unit for identification
- Connection of up to two external devices into the safety circuit
- Battery buffered loud speaking units
- 32 loud speaking systems connectable to the WL200 main unit in the control room
- Two integrated loudspeakers in one unit
- High volume (105 dB) and good intelligibility
- Monitored system line
- Adjustable volume and microphone

## Benefits:

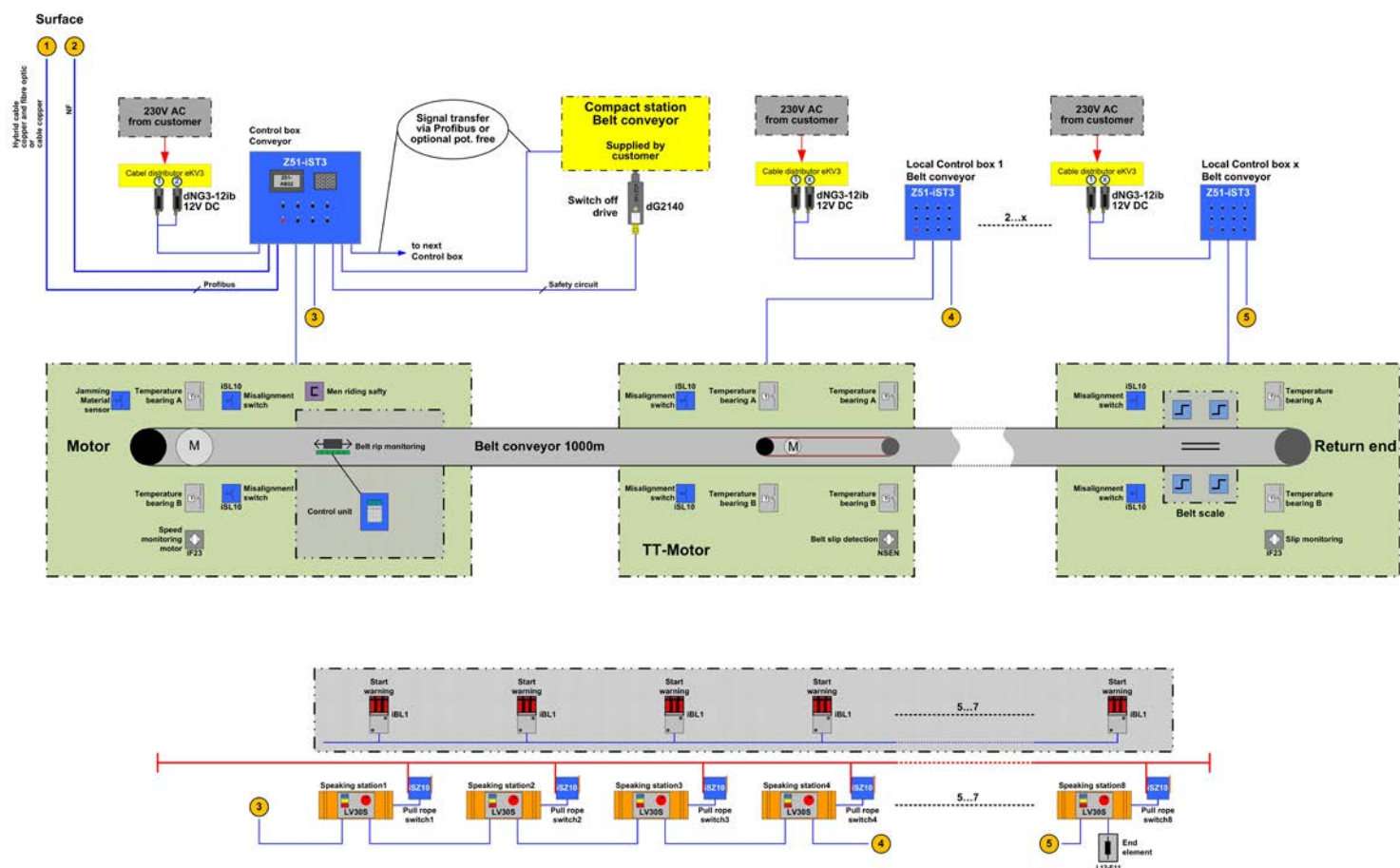
- For use in combination with belt conveyor control system
- Easy system setup by pre-fabricated system cable
- Announcement of up to 32 text messages for easy fault finding
- Easy integration of external safety devices







# Belt conveyor control system







### Features:

- Fully integrated system layout with digital/analogue modules, loudspeaker and interlock devices
- Ensures 3 types of control: local control, control with blockade and central control from surface
- Acoustic warning of belt conveyor start
- Announcement of 32 free programmable text messages
- Control of safety circuit (SIL 3) including number detection of operated devices
- Free programmable system software with standard PLC software (multiprog) in accordance with IEC61131 Norm
- Intrinsically safe 10.1" Display for system visualisation
- Control of up to 3 belt conveyors
- Several interfaces (profibus-DP, ethernet, serial interface)
- Fiber optic interface to surface station
- Easy connection to loudspeaker and interlock system L112
- Remote station connectable by loudspeaker system cable
- Protection class: IM2 Ex ibI Mb

### Benefits:

- Easy system setup through prefabricated system cable
- Easy system setup by standard plc software





# Alarm telephone system - ATAR

## Features:

- Warning and information about possible risk situations to the workforce with loud playback of call signal, alarm sound and alarm texts on the speaker of the alarm phones
- Manual or automatic alarm text message to each alarm phone, groups of phones or all phones
- Manual or automatic checking the operating status of alarm phones, such as battery and line monitoring, including logging
- Emergency call function with automatic connection establishment and identification logging of the calling party
- Variable power supply of the alarm phones:  
Battery module 9V/15Ah or local power supply buffered with battery modul 1,1Ah
- System can operate with two Alarm Servers and one Client
- Up to 240 alarm phones can be connected to one alarm server
- A maximum of 480 alarm phones can be connected to the system
- Can connect to available telephone systems/PBX with DTMF (DTMF) telephones and/or pulse dialing telephones

## Benefits:

- Easy installation and system setup, due to 2-wire technology
- Dual use of the system: Telephone calls/ Alarm announcements
- High reliability and availability
- Continuous communication even in presence of high methane gas (CH<sub>4</sub>) concentration
- New dimension of employee's safety in a complete mine
- Fast reaction time in case of a mine accident

## References:

### Telephone system

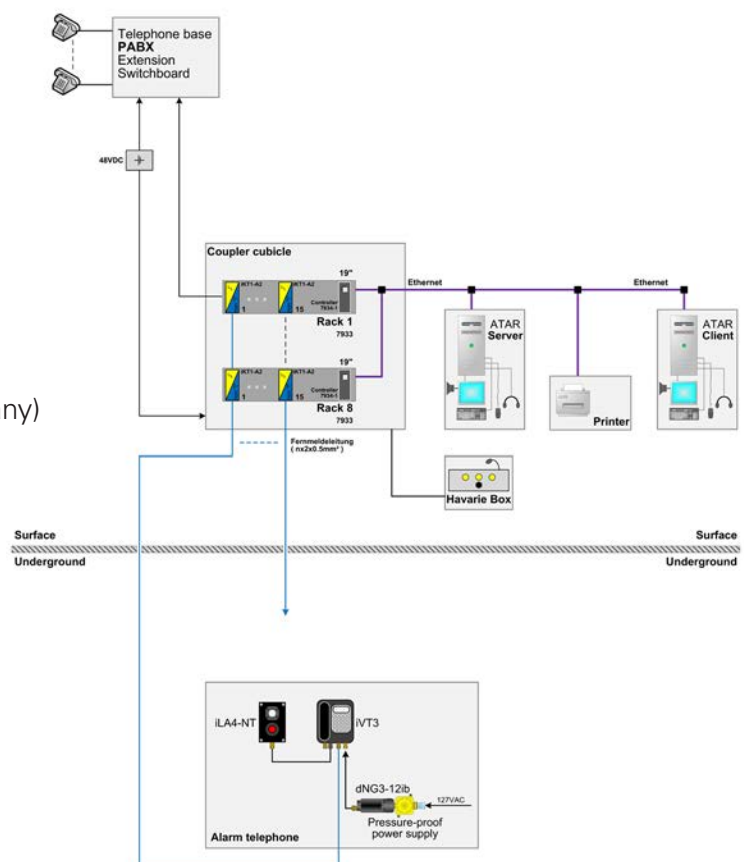
ATAR Server, ATAR Client, 240 Telephones  
Norilsk Nickel (Russia)

### Telephone system

ATAR Server, 30 Telephones  
Cleveland Potash (UK)

### Telephone system

ATAR Server, ATAR Client 32 Telephones  
DBE Gorleben (Nuclear Waste disposal) (Germany)



**ATEX**





# iVT3 – intrinsically safe telephone

## Features:

- Intrinsically safe analogue telephone, achieved by use of telephone couplers
- Corrosion free plastic housing
- Variable power supply by:
  - Battery module (9VDC/15Ah)
  - Local power supply with buffering through rechargeable battery module
- LC display for operating support and easy setup
- Available in multiple languages (English, Turkey, German etc.)
- Robust stainless steel keyboard (V4A)
- 5 function keys for menu navigation
- Normal dialing/redialing and dialing from the phone book
- Handset and hands free mode
- Output for external loudspeaker and signaling device (call signal, alarm announcement)
- Volume control of handset and external loudspeaker

## Benefits:

- Full intrinsically safe telephone category M1 Ex ia I MA
- Can be used in high methane gas concentration
- Battery life time from up to 1 year
- Connection distance from up to 20km
- Very robust and reliable construction







# Gas monitoring system

Data communication system ZM51 for data transmission of methan, carbon, monoxid dust concentration and air velocity

## Features:

- Modular system layout with digital/analogue modules
- Software approved by notified body (DMT-Germany)
- Data bus via copper cable or fiber optic ring
- Can reach up to 20km
- Cyclic check of system function by reference values
- Local system shut down functionality
- Remote calibration of gas sensors
- System certified according IM1 Ex ia IMA
- Substation buffered by local IS UPS
- Open interface to surface Scada systems
- Open architecture for different type and suppliers of sensors

## Benefits:

- High safety and system availability through approved software and system design
- Can be used in presence of high methane gas concentration
- Easy system extension by modular design
- Cost savings through local calibration

## References:

**Gas monitoring system for nuclear waste deposit**  
DBE Gorleben

**Gas monitoring system for Velenje mine**  
Premogovnik Velenje

**Gas monitoring system for German coal mines**  
Ruhrkohle Aktiengesellschaft (RAG)











# Underground automation systems

## Features:

- The Z51-ZM22 is a fully configurable and programmable intrinsically safe system
- Flexible system configuration allows for control over various technological processes
- IEC 61131 programming system with Multiprog 5.X
- Colour graphic display 10.4 "
- Interface for remote I/O's (Profibus, Ethernet, Modbus)
- Data transmission by fibre optic
- Remote access from surface

## Intrinsically safe micro computer Z51-ZM-22

## References:

### Automation for Rotation Tipper

Ruhrkohle Aktiengesellschaft (RAG)

### Main Water Pumping Station

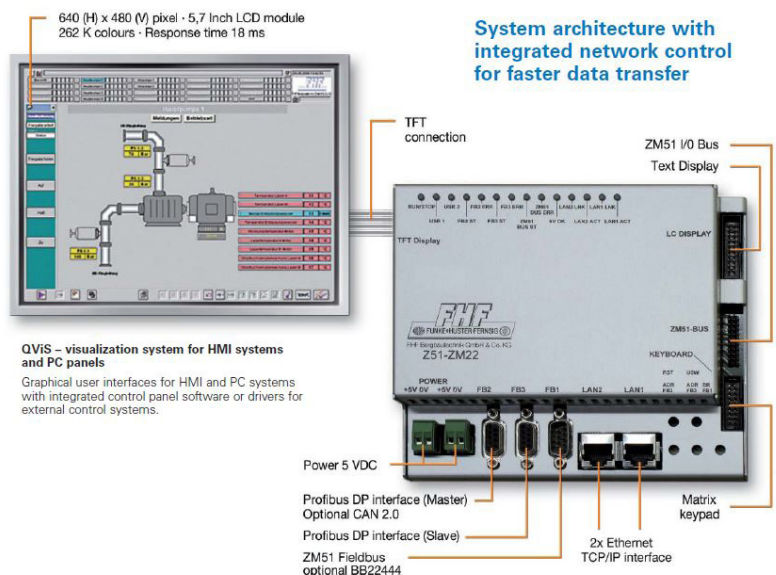
Ruhrkohle Aktiengesellschaft (RAG)

### Retractable guiding rail

Voith Turbo /China

### High pressure pumps

HYDROWATT Switzerland/Russia



# WL200 - Dispatcher system for underground communication

## Features:

- The WL200 dispatching system is able to connect loudspeaker systems with telephone and wireless (MR90) communication systems
- Single communication lines can be connected to complete communication network
- Central unit with high end Touch scada system (free programmable)
- Coupling units to reach highest protection class: IM1 Ex ia IMA
- Connectable to third party system (Gas monitoring, Fire detection systems)
- 32 pre-defined alarm announcements and pre start warnings
- Variable call functions:
  - communication between each lines by authorization from the operator desk at the surface
  - communication from the central desk to the lines and from the lines to the central desk
  - general announcement to the mine (all lines) from the control desk
  - general announcement to the each line from the control desk
  - flash light alarm signals for the each line, group of lines or to the mine (all lines)
- Voice recording of communication lines

## Benefits:

- Enhancement of underground safety by consistent communication concept
- Easy system setup by free programmable Scada system
- System expandable by use of an expansion rack

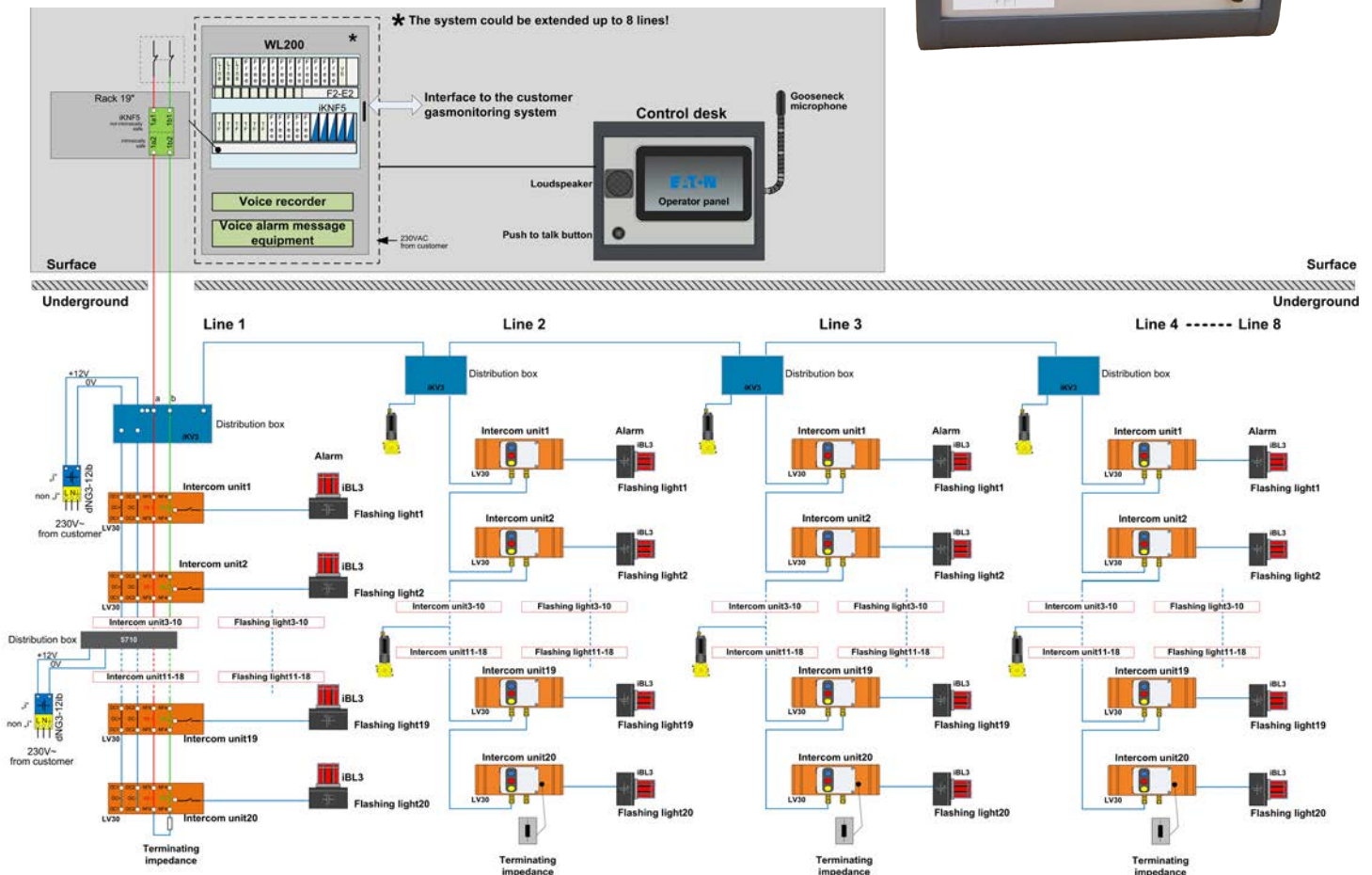
## References:

### Various WL200 systems for coal mines

Ruhrkohle Aktiengesellschaft (RAG)

### WL200 system for 6 lines

Imbat Madencilik / Turkey







Eaton

# The safety you rely on.

See the complete offering at [www.crouse-hinds.com/hac](http://www.crouse-hinds.com/hac)

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