METHANOMETRY, AUTOMATION, MINING AND INDUSTRIAL ELECTRONICS

HASO

CATALOGUE OF PRODUCTS

Methanometry, automation, mining and industrial electronics

CATALOGUE OF PRODUCTS

CONTENTS

HISTORY

HASO S.C. was founded in 1990. Its main purpose is the development and production of innovative systems and telemetry equipment in the fields of mining, industrial automation, visualization, monitoring and controlling influence on the growth of machine performance, reduce operating costs and improvement of safety.
As a manufacturer of security systems and cooperating devices, we place great emphasis on continuous development and improvement of existing products and investment in the latest technology. Individual approach to each client allows us to a precise identification of the current needs, and cooperation with world leaders enables access to innovative solutions.

Our motto is:

„Quality is a way of thinking that causes apply and is constantly looking for the best solutions."

/E.Deming.

25 years
1990 - 2015

OFFER:

As part of its activities we offer:

- Security systems designed for underground mines:
  - Integrated Safety Systems CST
  - Switch-off interlocking and controlling system SBKW
  - Presentation system of industrial processes SP3
  - Safety system for IS Communications and tracking of people and assets in underground coal mines - MST Track
- System assisting methanometry dispatchers in underground mines SWμP-3
- Industrial Automation:
  - Systems of control, visualization and management of production processes
  - Measurement & Inspection devices
  - Measuring systems for monitoring the applications of inert gases
- The blasting technique
- Services associated with the production of electrical equipment for underground mines:
  - Twenty-four-hour service
  - Inspection, repair and maintenance of individual components for devices
  - Modernization and repair of measuring equipment

CERTYFICATES

All of our equipment designed for underground mines have EC type examination certificates (ATEX), and safety systems have admittance issued by the President of State Mining Authority.
Furthermore for improving the quality, respect for safety rules and improving organization of work has been implemented an Integrated Management System that meets the requirements of PN-EN ISO 9001:2009 „Quality Management Systems" and PN-N-18001: 2004 „Safety Management System and Occupational Health". The company also has a Quality Assurance Notification No. GIG 12 ATEXQ 052 issued by the Central Mining Institute.


EC-TYPE EXAMINATION CERTIFICATE

KDB 11ATEX097

Anemometer CSV-5

„HASO" S.C.
J. Maciszek & A. Paszek

ul. Towarowa 20, 43-100 Tychy

I M1 Ex ia I
II 2G Ex ia IIB T4


Główny Instytut Górnictwa
CENTRAL MINING INSTITUTE
JEDNOSTKA CERTYFIKUJĄCA
CERTIFICATION BODY

CERTIFICATE
OF INTEGRATED MANAGEMENT SYSTEM
No. QS / 26 / III / 14

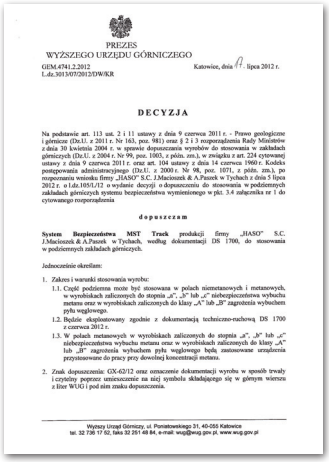
It is hereby confirmed that:

„HASO" s.c. J. Maciszek & A. Paszek in Tychy

meets the requirements of PN-EN ISO 9001:2009 standard
„Quality management systems. Requirements" in the area of activity:
design, installation and maintenance of electronic equipment and systems automation and software

and the requirements of PN-N-18001:2004 standard „Occupational health and safety management systems. Requirements" in the area of activity:
installation, servicing of electrical equipment and automation systems in mining plants

The certificate is valid from 15 May 2014 to 14 May 2017, subject to compliance by the holder with PN-EN ISO 9001:2009 and PN-N 18001:2004 standard


PREZES
WYŻSZEGO URZĘDU GÓRNICZEGO

DECYZJA

dopuszczam


GŁÓWNY INSTYTUT GÓRNICTWA
CENTRAL MINING INSTITUTE
CERTIFICATION BODY

NOTIFICATION OF QUALITY ASSURANCE

Equipment and protective systems intended for use in potentially explosive atmospheres
Directive 94/9/EC

GIG 15 ATEXQ 052

„HASO" s.c. J. Maciszek & A. Paszek
ul. Towarowa 20
43-100 TYCHY
POLAND

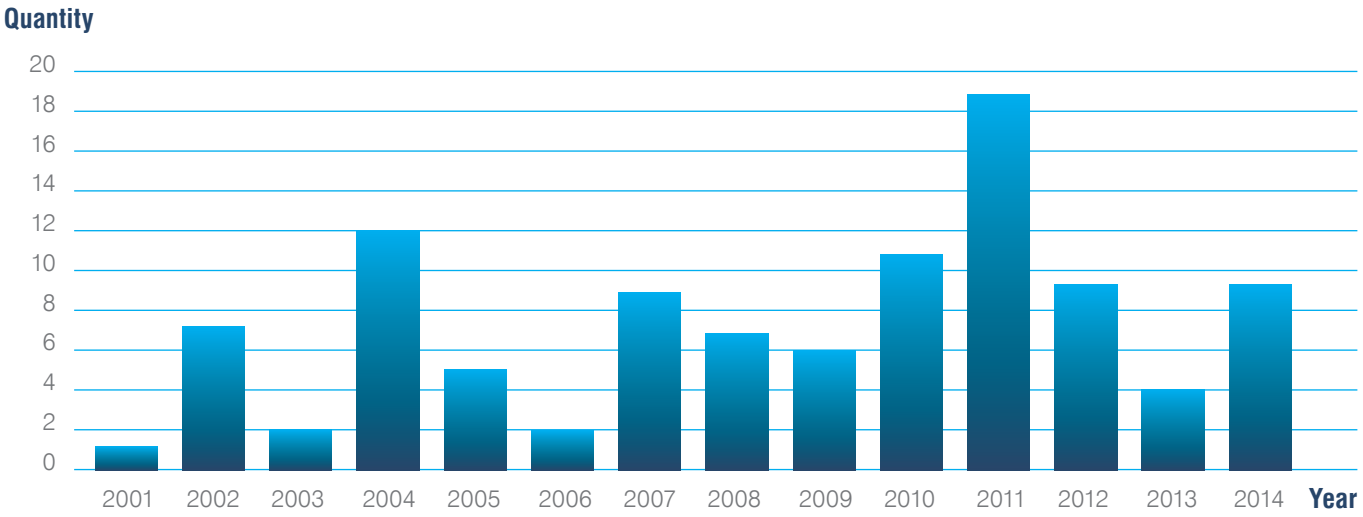
as above

DIRECTOR
of the Certification Body

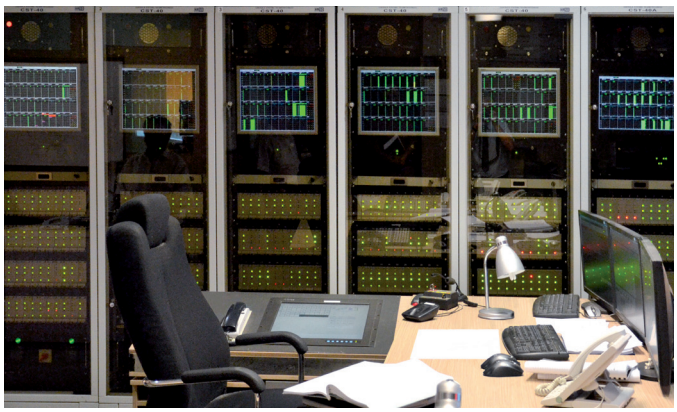
Integrated Safety System **CST** is built based on telemetric central stations type **CST-40**, **CST-40A**, **CST-40C**, sensors and equipment connected to them, and a master system - **SWμP-3**.

The system is designed for:
- ➥ continuous control and recording of parameters concerning in mines with methane, fire and ventilation hazards
- ➥ switching off the power supply of machines and electric devices in cases where permissible parameters have been exceeded
- ➥ control and recording of work of selected devices having an impact on safety or production process
- ➥ performing complex inspection of work of connected sensors and switching off the power devices
- ➥ transmission of signals about occurring alarms and overflows into the alarm broadcast system.

Sales of methanometry central station stypes CST-40(A) and CST-40C in 2001-2014 (in pieces*)



*One panel is calculated for 40 measurement channels

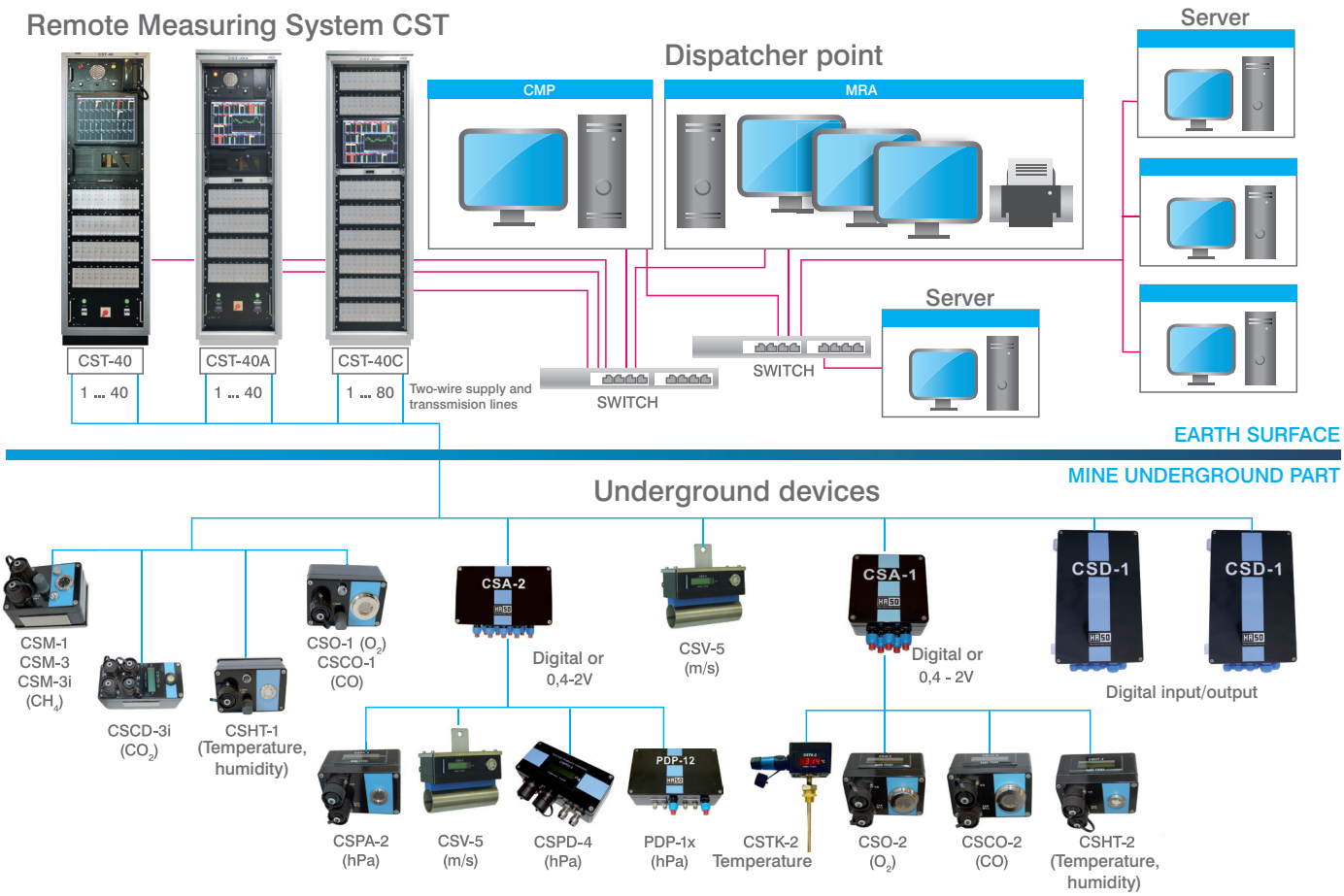


Basic technical data:

Power supply	230 VAC (+5%, -10%)
Transmission types	digital or based on frequency
Number of measurement channels	40 – one central station CST-40(A), 80 – one central station CST-40C
Operation mode	automatic with possibility of manual query
Measurement time of one line	1 ÷ 4s depending on type of sensor
Time of one measurement cycle	1 ÷ 8s depending on type of sensor on the line
Power supply shutdown time	< 5 s - e.g., for CSM-1, CSM-3
Distance between central and sensor	≥ 10 km (CSM-1, CSCO-1, CSM-3, CSHT-1)
Recording of measurement results	computer recorder
Visualization	LCD monitor
Alarm thresholds	set up in all measurement range
Sending of overflow alarms	from any alarm circuit to any lines in the system of CST-40(A), CST-40C central stations

➥ The system has admittance issued by the President of State Mining Authority, symbol: GX – 64/13.

Configuration of system CST

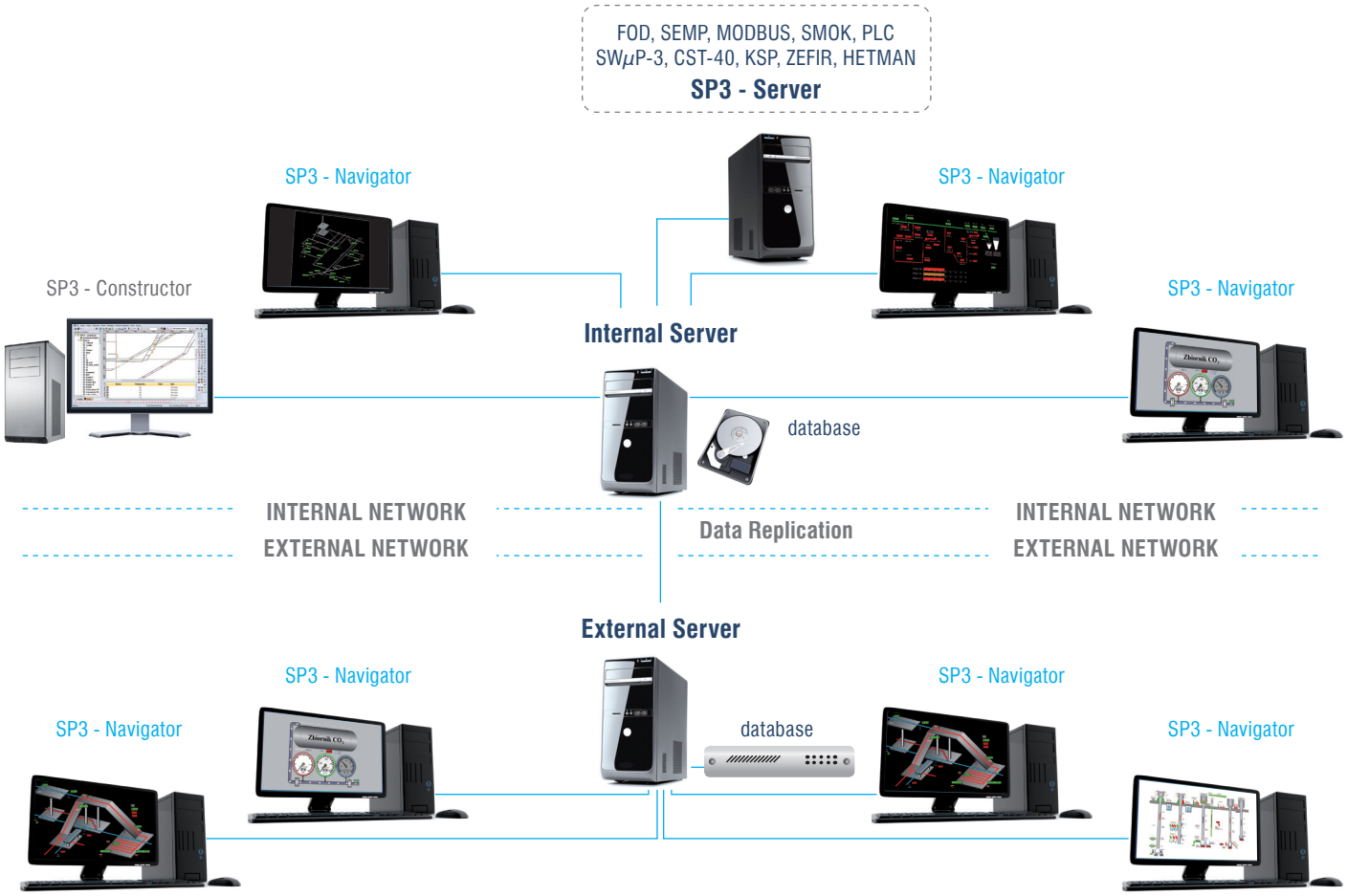


PRESENTATION SYSTEM OF INDUSTRIAL PROCESSES SP3

Presentation system of industrial processes **SP3** provides the possibility of continuous recording, processing, archiving and visualization of measurements on the basis of data collected from sensors of measuring systems, with which **SP3** has configured connection. The system is adapted to the requirements of the mine dispatcher service through the implementation of its main functions, namely:

- graphical presentation of current and archived measurements on any size scalable boards, diagrams, maps, etc., in a way adapted to the user's perceptual capabilities taking into account the current technological and ventilation schemes of mine
- alarming in critical situations and warning of the occurring dangers
- archiving of measurements and alarms data
- displaying of archival measurement data in the form of graphs or alphanumerically
- creation and printing of reports and generating statistics based on archival measurements
- identification of the type, number and source of sensor measuring system
- the possibility of multi-monitor work, settings adjustment and save the created configuration for user convenience
- determining the extent of individual user accounts.

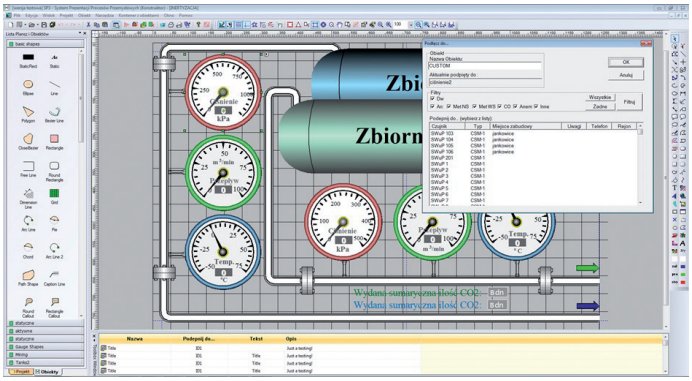
Configuration of Presentation system of industrial processes SP3



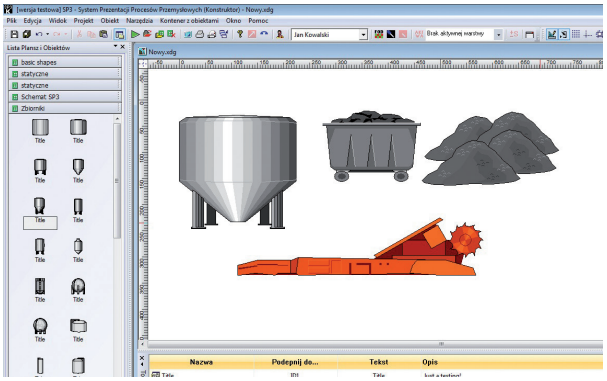
System SP3 is composed of the following, connected to each other with computer network, modules:

- SP3- Constructor
- SP3- Navigator
- SP3- Server

SP3-Constructor - allows the creation of any kind of fully scalable charts, maps, diagrams, on which are placed the objects animating display of user-defined sensors available in the system. The extensive set of graphical tools, like the library of ready components, allows quick creation of advanced and powerful graphical charts and edit those already existing in the system.

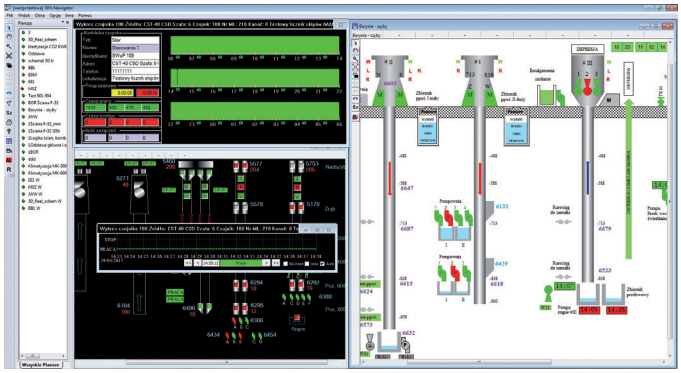


SP-3 Constructor program window.

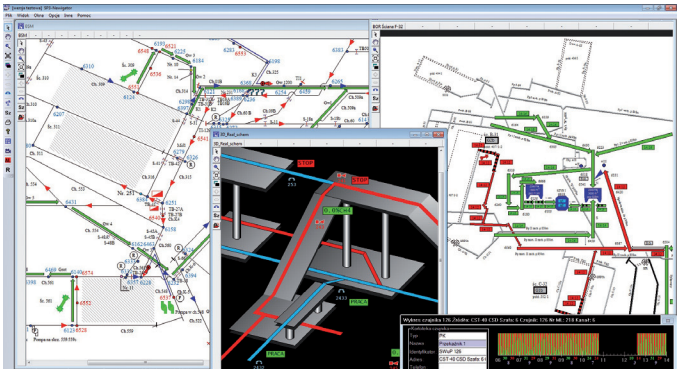


Library of objects ready to be placed on the board.

SP3-Navigator - allows to run previously created charts in separate windows, and provides for continuous monitoring of current measurements (also in the form of graphs). The charts and graphs are displayed in the windows that you can freely distribute on monitors or other display devices.



SP3-Navigator program window.



An example of program operation SP3-Navigator.

SP3-Server - is used for the collection, archiving and sharing of data for the entire system.

The main advantages of the system SP3:

- The possibility of collection data from various systems (SWuP-3, ZEFIR, SMP, SMOK, FOD, PLC, etc.)
- Observation of measurements from various systems in one place
- An extensive palette of graphical tools
- Simple, intuitive operating.

Safety system **MST Track** is dedicated for IS Communications and tracking of people and assets in underground coal mines.
System **MST Track**:

- allows the operative management of the movement of workers during regular operation and in an emergency
- registers the transition of employees by the system checkpoints
- informs the dispatcher in emergency mode, whether there is a person in the dangerous zone or a person's residence time in the dangerous zone has been exceeded
- allows to alert a person in the dangerous area about events
- allows to archive the data.

System infrastructure **MST Track** can be used to transmit data, voice, video, checking and controlling processes and wireless communication.

Structure of System

Safety system MST Track consists of a surface part and underground part.

Surface part

The surface part includes:

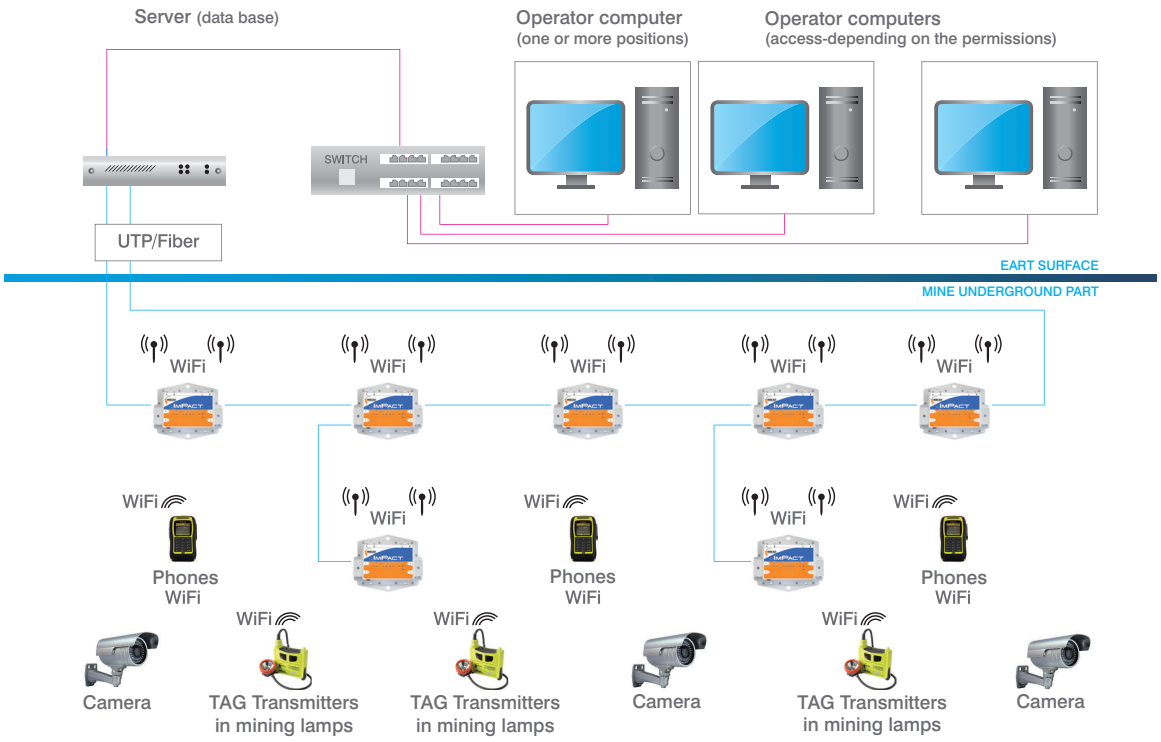
- Configured hardware server along with maps of the mine and applications of location system, and installed SQL database,
- Working positions (operators and customers) with installed applications „MineDash".
  The „MineDash" application allows view from any position within the mine network through a web browser.
  It allows to locate all of employees at any time and from any place.
- The configuration position with ica administration console software.

Underground part

The underground part includes:

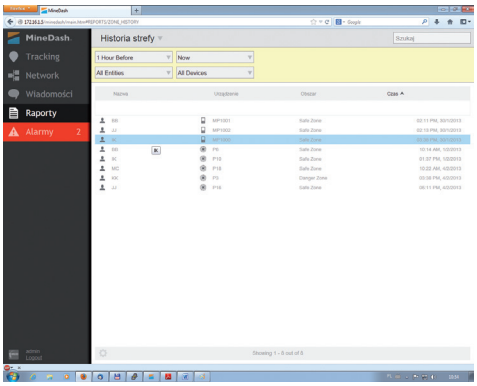
- The intrinsically safe wireless network switches NS40 (A) with antennas.
- Intrinsically safe power supplies ZIB-2 with battery.
- IDs radio Tags in two versions: portable or internal - designed for installation in mining lamp.
- Optical fiber cables and power cables.
- Banners and sounders for display information at specified positions in the mine.
- Switches, converters and network barriers.

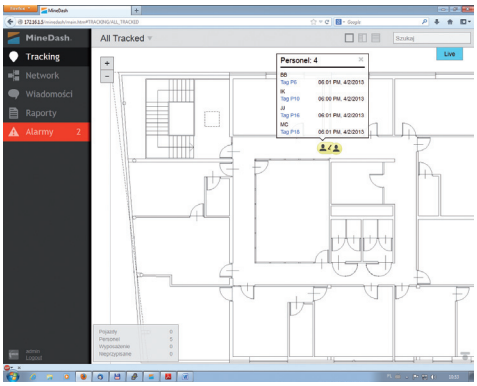
Configuration of Safety system MST Track



Basic technical data:

Server power supply	230 VAC (+ 5 %, - 10 %), 50Hz; uninterruptable
Server transmission type	Ethernet fiber optic and cables
Switch transmission type	Ethernet fiber optic and WiFi
Type of fiber optic transmission	singlemode
Number of switch NS40 fiber ports	4
Speed of fiber optic transmission	100 MBit/s
Max. WiFi transmission speed	54 Mbit/s
Transmission type of tags and phone	WiFi- 2,4 – 2,5GHz
Max. output power of radio transmission switch NS40	251mW
Transmission type TAG - switch NS40	radio WiFi





Control Units are generally intended for use with the safety system CST. They can also operate with other systems, on condition that they comply with the supply & measurement line parameters.

Analogue Signal Control Unit CSA-1, CSA-2

The main purpose of using the CSA-1 unit is the possibility of connecting sensors with voltage analogue outputs of 0,4 – 2V to the CST system, and additionally 2-stage inputs and 2-stage outputs for Control Unit CSA-2. The unit not only does the measurements and transfers them, but also supplies the connected sensors with power. Application of the control unit highly extends the measurement capability of the CST-40, CST-40A, CST-40C units and allows to connect 4 sensors to a single line.

CSA-1	
Transmission mode	digital
Max. length of a supply-transmission line	8 km
Max. length of a sensor line	1500 m
Protection index	IP 65
ATEX certificate	KDB 05ATEX039X
Explosion-proof mark	Ex I M1 Ex ia I
Number of analogue inputs	4

CSA-2	
Transmission mode	digital
Max. length of a supply-transmission line	8 km
Max. length of a sensor line	1500 m
Protection index	IP 65
ATEX certificate	KDB 10ATEX0043X
Explosion-proof mark	Ex M1 Ex ia I
Number of analogue inputs	4
Number of digital inputs	4
Number of 2-state outputs	2

Two-State Signal Control Unit CSD-1

CSD-1 highly extends the measurement capability of the system central CST-40(A), CST-40C and enables a variety of 2-state sensors to be connected to it. To each CST supply-transmission line a single CSD-1 control unit can be connected. The unit has sixteen 2 -state voltage free inputs and eight voltage free 2-state outputs. Input signals are checked for shortcuts in connected lines. Furthermore unit can be programmed from the CST central system and can function as a protection for power shut-offs, enable signal lines or control other electrical equipments.

CSD-1	
Transmission mode	digital
Max. length of a supply-transmission line	8 km
Run time on own power supply	> 12h
Number of 2-state inputs	16
Max resistance of input circuit	400Ω
Line check mode	Diode at checked contact in series
Number of 2-state outputs	8
Protection index	IP 65
ATEX certificate	KDB 05ATEX010X
Explosion-proof mark	Ex I M1 Ex ia I

Methane Detectors CSM-1, CSM-1R, CSM-3, CSM-3i, CSM-3m

Methane Detectors CSM-1, CSM-1 version R, CSM-3, CSM-3i, CSM-3m are stationary devices for measuring methane content in explosion hazard areas in underground coal mines. They mainly cooperate with telemetric central stations type CST-40, CST-40A, CST-40C in area of data transmition. They can also cooperate with other telemetric stations, provided that the parameters of the feeder-measurement line are compatible.
Methane Detectors have one or two outputs (UW) used to control equipment switching off power supply when the preset alarm thresholds have been exceeded. Optionally, they may also be equipped with ambient temperature sensor. Its autonomous supply system (battery) supplies the methane detector when the feeder line is switched off. The communication with the methane detector is carried out by means of digital transmission through the feeder-measurement line of the central station and through the type KR-2 calibrator. The calibrator communicates with the methane detector through a radio link.
Methane Detectors are devices in category M1, therefore, they may be used in all underground mines with methane or coal dust explosion hazard.

CSM-1	
Measurement range:	0-5% CH_4 (catalytic) 5-100% CH_4 (conductometric)
Measurement method	continuous
Response time	≤ 5s
Casing internal protection	IP54
Type test certificate	KDB 06 ATEX 428
Explosion-proof mark	Ex I M1 Ex ia I

CSM-1 version R	
Measurement range	0-100% CH_4 (conductometric)
Measurement method	continuous
Response time	≤ 15s
Casing internal protection	IP54
Type test certificate	KDB 06 ATEX 428
Explosion-proof mark	Ex I M1 Ex ia I

CSM-3, CSM-3i & CSM-3m	
Measurement range	**CSM-3**: 0-5% CH_4 (catalytic) 5-100% CH_4 (conductometric) **CSM-3i, CSM-3m**: 0-100% CH_4 (IR)
Measurement method	continuous for CSM-3 IR, continuous for CSM-3i, CSM-3m
Response time	≤ 5s for CSM-3 ≤ 25s for CSM-3i ≤ 7s for CSM-3m
Display	LCD
Casing internal protection	IP54
Type test certificate	KDB 09 ATEX 094
Explosion-proof mark	Ex I M1 Ex ia I Ma

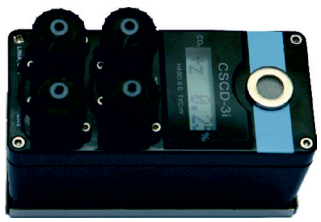
SENSORS connected directly to the central station:

Sensors of this group are stationary devices for measuring atmospheric parameters in explosive atmospheres in underground coal mines. They cooperate mainly with telemetric central station CST-40, CST-40A and CST-40C in area of data transmission (they are connected directly to the central station). They can also cooperate with other systems, provided that they comply with the supply and measurement line parameters.

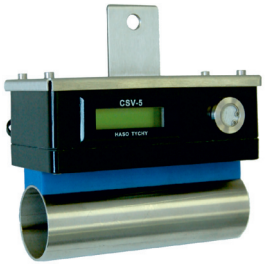
Name	Carbon monoxide concentration sensor
Type	**CSCO-1**
Measurement range	0-1000 ppm for digital transmission 0-200 ppm or 0-1000 ppm for transmission frequency
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

Name	Oxygen concentration sensor
Type	**CSO-1**
Measurement range	0-25% O_2
Measurement method	continuous
Response time	≤ 20s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

Name	Humidity and temperature sensor
Type	**CSHT-1**
Measurement range	Humidity 0÷100%RH Temperature -20÷50°C
Measurement method	continuous
Response time	for humidity measurement ≤ 4s, for temperature measurement ≤ 30s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I



Name	Carbon dioxide concentration sensor
Type	**CSCD-3i**
Measurement range	0-5% CO_2
Measurement method	IR, continuous
Response time	≤ 25s
Casing internal protection	IP54
Type test certificate	KDB 09 ATEX 094
Explosion-proof mark	Ex I M1 Ex ia I



Name	Anemometer
Type	**CSV-5**
Measurement range	± (0,1÷10) m/s
Measurement method	continuous
Response time	≤ 2s
Casing internal protection	IP54
Type test certificate	KDB 11 ATEX 097
Explosion-proof mark	Ex I M1 Ex ia I Ex II 2G Ex ia IIB T4

Name	Hydrogen sulphide concentration sensor
Type	**CSHS-1**
Measurement range	0-200 ppm H_2S
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

Name	Sulfur dioxide concentration sensor
Type	**CSSD-1**
Measurement range	0-100 ppm SO_2
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

Name	Nitrogen oxide concentration sensor
Type	**CSNO-1**
Measurement range	0-250 ppm NO
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

Name	Nitrogen dioxide concentration sensor
Type	**CSND-1**
Measurement range	0-20 ppm NO_2
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 131
Explosion-proof mark	Ex I M1 Ex ia I

The sensors in this group are stationary devices, designed to measure atmospheric parameters in explosive atmospheres in underground coal mines. They cooperate with telemetric central station type CST-40, CST-40A and CST-40C through analogue station CSA-1 and CSA-2. They may also cooperate with other devices provided that the terminal of the feeder-measurement line is compatible.

Name	Carbon monoxide concentration sensor
Type	**CSCO-2**
Measuring range	0-1000 ppm CO
Measurement method	continuous through diffusion
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 257
Explosion-proof mark	Ex I M1 Ex ia I

Name	Oxygen concentration sensor
Type	**CSO-2**
Measuring range	0-25 % O_2
Measurement method	continuous through diffusion
Response time	≤ 20s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 260
Explosion-proof mark	Ex I M1 Ex ia I

Name	Humidity, temperature and atmospheric pressure sensor
Type	**CSPA-2**
Measuring range	atmospheric pressure, standard from 800 hPa to 1300 hPa atmospheric pressure, extended from 800 hPa to 1600 hPa relative humidity from 0% RH to 100% RH temperature from -20°C to +50°C
Measurement method	continuous
Response time	≤ 2s for atmospheric pressure measurement ≤ 30s for temperature measurement ≤ 4s for relative humidity measurement
Casing internal protection	IP54
Type test certificate	KDB 09 ATEX 095
Explosion-proof mark	Ex I M1 Ex ia I

Name	Differential pressure sensor
Type	**CSPD-4**
Measuring range	± 250 Pa (Type: 0250) ± 1250 Pa (Type: 1250) ± 2500 Pa (Type: 2500) ± 5000 Pa (Type: 5000) ± 7500 Pa (Type: 7500)
Measurement method	continuous
Response time	≤ 2s
Casing internal protection	IP54
Type test certificate	FTZU 10 ATEX 0053
Explosion-proof mark	Ex I M1 Ex ia I

Name	Humidity and temperature sensor
Type	**CSHT-2**
Measuring range	Humidity 0÷100% Temperature -20÷50°C
Measurement method	continuous through diffusion
Response time	≤ 4s for measurement of humidity ≤ 30s for temperature measurement
Casing internal protection	IP54
Type test certificate	KDB 08 ATEX 132
Explosion-proof mark	Ex I M1 Ex ia I

Name	Hydrogen sulfide concentration sensor
Type	**CSHS-2**
Measuring range	0-200 ppm H_2S
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 257
Explosion-proof mark	Ex I M1 Ex ia I

Name	Sulfur dioxide concentration sensor
Type	**CSSD-2**
Measuring range	0-100 ppm SO_2
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 257
Explosion-proof mark	Ex I M1 Ex ia I

Name	Nitrogen oxide concentration sensor
Type	**CSNO-2**
Measuring range	0-250 ppm NO
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 257
Explosion-proof mark	Ex I M1 Ex ia I

Name	Nitrogen dioxide concentration sensor
Type	**CSND-2**
Measuring range	0-20 ppm NO_2
Measurement method	continuous
Response time	≤ 40s
Casing internal protection	IP54
Type test certificate	KDB 07 ATEX 257
Explosion-proof mark	Ex I M1 Ex ia I

Name	Probe thermometer
Type	**CSTK-2**
Measuring range	from -20°C to +50°C
Measurement method	continuous
Response time	≤ 2min (air velocity: v=2 m/s)
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0023X
Explosion-proof mark	Ex I M1 Ex ia I Ex II 2G Ex ia IIC T4

Name	Hydrogen concentration sensor
Type	**CSH-2**
Measuring range	0,1% H2 with a measuring range of 0 to 0,100% H2 (0÷1000 ppm H2) 1% H2 with a measuring range of 0 to 1,000% H2 (0÷10000 ppm H2) 4% H2 with a measuring range of 0 to 4,000% H2 = 100% DGW (0÷40000 ppm H2)
Measurement method	continuous
Response time	≤ 40s - 110s (depending on version)
Casing internal protection	IP54
Type test certificate	KDB 13 ATEX 0052
Explosion-proof mark	Ex I M1 Ex ia I Ex II 2G Ex ia IIC T4

CONVERTER CSKA-420 and CSKC-485

Converter CSKA-420 is a device used to convert the current signal from 4-20mA and 0-20mA standards into digital form, whereas CSKC-485 converter is a device used to convert digital signals from RS422/RS485 standard into telemetric central station type CST-40, CST-40A and CST-40C. RS485/RS422 interface connector is a separate intrinsically safe circuit and is galvanically isolated from the rest of the system. Both converters work directly via the supply and transmission line of telemetric central station CST-40, CST-40 or CST-40C. Converters CSKC-420 and CSKC-485 are devices of M1 and 2G category. Field of use shall include all establishments of underground mining with possible methane or coal dust explosion hazard. The device can also work in threatened areas beyond the mining industry.

Name	Converter
Type	**CSKA-420**
Measuring range	0-25 mA
Measurement method	continuous
The input impedance	100Ω
Working temperature	from -10°C to +40°C
External dimensions	110 x 75 x 56 mm
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0055X
Explosion-proof mark	Ex I M1 Ex ia I Ma Ex II 2G Ex ia IIB T4 Gb

Name	Converter
Type	**CSKA-485**
Serial Interface	RS422/485
Working temperature	from -10°C to +40°C
External dimensions	110 x 75 x 56 mm
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0056X
Explosion-proof mark	Ex I M1 Ex ia I Ma Ex II 2G Ex ia IIB T4 Gb

Intrinsically safe converter IK1 – x/x

Intrinsically safe converter IK1 – x/x is a device used to convert digital signals in following standard: Serial RS232/422/485, Ethernet 100Base-TX, 100Base-FX optical, radio WiFi IEEE 802.11b/g, Modbus/RTU RS-xxx and Modbus/TCP.
Converter is available in the following versions:

IK1-R/F Intrinsically safe converter RS-xxx standard into 100Base-FX optical standard
IK1-R/W Intrinsically safe converter RS-xxx standard into WiFi IEEE 802.11b/g standard
IK1-R/E Intrinsically safe converter RS-xxx standard into Ethernet 100base-TX standard
IK1-E/F Intrinsically safe converter Ethernet 100base-TX standard into 100base-FXoptical standard
IK1-E/W Intrinsically safe converter Ethernet 100base-TX standard into WiFi IEEE 802.11b/g standard
IK1-RM/F Intrinsically safe converter of the Modbus/RTU RS-xxx standard to Modbus/TCP via 100base-FX optical standard
IK1-RM/E Intrinsically safe converter of the Modbus/RTU RS-xxx standard to Modbus/TCP via 100base-TX Ethernet standard

Power supply	12÷15V DC
Serial Interface	RS-232/422/485
Network interface	electrical: 100BASE-TX
	optical: 100BASE-FX
	radio-WiFi 802.11b/g
Working temperature	from -10°C to +40°C
External dimensions	190x75x75mm
Casing internal protection	IP-54
Certificates	TEST 13 ATEX 0057X, IECEx FTZU 15.0008
Explosion-proof mark	Ex I M1 Ex ia I Ma, Ex ia op is I Ma

Differential pressure transducer PDP-1x

Differential pressure transducer **PDP-1x** is a stationary, contact device used to control the pressure difference. It is intended for use primarily in mines in order to control the opening, closing and sealing ventilation dam, airflow in separately ventilated wall and for signaling the level of the water in sump. The pressure is indicated as a digital signal, and the threshold value is set individually.

Measuring range	20÷4500 Pa (0,2-45 mBar)
Pressure entry	2 or 4 connectors
Cable entry	1 or 2 cable glands
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0042X
Explosion-proof mark	Ex I M1 Ex ia I Ex II 2G Ex ia IIC T6

Calibrators

Calibrators are devices designed for carrying out tests and measurements of devices operating in explosion hazard areas in underground coal mines. **Calibrator KR-2** is a portable microprocessor device, It is mainly used to cooperate with gas detection devices, e.g., CSM-1, CSHT-1, CSCO-1, CSCO-2, CSO-2, CSPA-2, CSM-3, CSM-3i and CSCD-3i. The calibrator communicates with such devices via radio waves or by cable.

Power supply	batteries 3,6 V
Transmission method	digital, by radio or with cable
Weight	0,35 kg
Casing internal protection	IP 54
Type test certificates	KDB 07ATEX256X
Explosion-proof mark	Ex I M1 Ex ia I

Calibrator KK-1 works mainly with a portable signaling methane detector MPS-1 and MPS-1i. Calibrator allows to connect methane detector to a computer to manage accounts, set alarm thresholds, archive data, etc.

INTRINSICALLY SAFE POWER SUPPLY ZIB-X

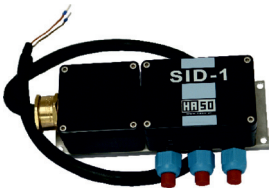
Intrinsically safe power supply **ZIB-x** is a stationary device used to supply intrinsically safe circuits. Power supply is designed in different variations with different input and output parameters. It is available in two versions: without battery backup (ZIB-1) and with a battery backup (ZIB-2). ZIB-x is supplied from non-intrinsically safe voltage 42VAC or 230VAC. In version ZIB-2, in the case of a power failure the unit goes into power mode with an external battery.

Supply voltage	230 VAC or 42 VAC
Nominal output voltage	12V or 15V
Rated output current	0,5A or 1A or 1,5A
Weight	10 kg
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0009X
Explosion-proof mark	Ex I M2 Ex eb mb [ia] I Ex II 2G Ex eb mb [ia] IIB T4

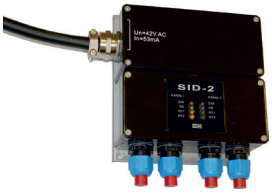
Supply voltage	230 VAC or 42 VAC
Nominal output voltage	12V or 15V
Rated output current	0,5A or 1A or 1,5A
Weight	15 kg
Warranted runtime	from 2,5h to 16h
Casing internal protection	IP54
Type test certificate	TEST 13 ATEX 0009X
Explosion-proof mark	Ex I M2 /M1 Ex eb ma mb [ia] I Ex II 2(1)G Ex eb ma mb [ia] IIB T4

SEPARATORS SID-1, SID-2, SID-3

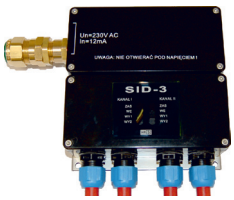
Intrinsically safe Two-Stage Separator type **SID-1**, **SID-2** & **SID-3** is a stationary device designed for transmitting two-stage information between intrinsically safe circuits. It is used for separation of intrinsically safe circuits in class “ia” or “ib” in any combination.



Power supply	42 VAC
Line check mode	diode in series
Weight	2,2 kg
Casing internal protection	IP54
Type test certificate	KDB 09 ATEX 107
Explosion-proof mark	Ex I M1/M2 Ex ia mb I



Power supply	42 VAC
Line check mode	diode in series
Weight	3,0 kg
Casing internal protection	IP54
Type test certificate	KDB 12 ATEX 0094
Explosion-proof mark	Ex I M1/M2 Ex ia I



Power supply	42 or 230 VAC
Line check mode	diode in series
Weight	2,3 kg
Casing internal protection	IP54
Type test certificate	FTZU 12 ATEX 0090
Explosion-proof mark	Ex I M1/M2 Ex ia I Ma Ex I M2 Ex e mb [ia Ma] I Mb

METHANE DETECTORS

Methane detectors **MPS-1**, **MPS-1i** are portable devices for measuring atmospheric parameters and signaling exceeding methane content in explosion hazard areas in underground coal mines. Thanks to the innovative technology methane detectors MPS-1, MPS-1i can be used:

- as a private methane detector,
- as a portable methane detector, hung in a mining work place (also blasting work) or in underground vehicles e.g. railway locomotive,
- as a methane detector it cooperates with exploder of electrical and electronical fuse. Methane detector will be used to block the exploder when the methane content have been exceeded,
- as a stationary methane detector with use of switching-off outputs UW1, UW2.

Measurement range	**for MPS-1**: 0-5% CH_4 (catalytic) 5-100% CH_4 (conductometric) **MPS-1i**: 0-100% CH_4
Measurement method	continuous, pellistor (**MPS-1**), IR (**MPS-1i**)
Casing internal protection	≤ 5s (**MPS-1**) and ≤ 25s (**MPS-1i**)
Casing internal protection	IP54
Type test certificate	FTZU 10 ATEX 0042X
Explosion-proof mark	Ex I M1 Ex ia I Ma

The connection box type MPS-1SP is an additional component for the portable device MPS-X. It is used to separate and double the quantity of two-state outputs (UW1 and UW2).

BLASTING EQUIPMENT: OSH-1, OSH-1T, RPB-1, ISO-1, OSA-2

Blasting ohmmeter type OSH-1 is designed for precise measurement of the resistance of blasting lines, blasting circuits and single electric detonators. Measurements may also be carried out in mine faces, close to loaded explosion material in blast holes. The device has two measurement ranges, 00.00÷99.99Ω and 100.0÷1999.9 and may be used in all underground and strip mines. The measurement current is checked by means of OSH-1T tester.

Stray currents recorder RPB-1 is designed for measurement of direct and alternating stray currents intensity in rock shooting sites and blasting agents storage places. It is a category M2 device and may thus be used in all underground mines with methane or coal dust explosion hazard.

Intrinsically safe signal light ISO-1 is a device dedicated for wheel transport in explosion hazard areas (It is used in underground mines – M1 category). It is a portable battery supplied device which emits pulsating light. The source of light are LED diodes.

Optical-acoustic siren OSA-2 is a stationary device designed for optical and acoustic signals. It is equipped with a digital input, working in „diode-in-series" mode. Input state enforces specific optical-acoustic signaling. OSA-2 is a device of M1 category.

MINING CAMERA KG-x

Mining camera in versions **KG-x** is a stationary device. It is designed to convert the image into a digital data stream. The video image is compressed in H.264 standard and then transmitted via optical fiber to 100BASE-FX or 100BASE-TX standard. The camera is produced in following types: KG-1 and KG-1z. In addition, both types of cameras (KG-1, KG-1z) are produced in the following configuration:

- analog or digital HD 1080p
- with or without factory-set zoom
- interface type fiber optic or cable (Ethernet).

Camera KG-x in each version has a hybrid connector on the housing, through which the power and fiber or ethernet patchcord is supplied to the camera. Mining camera version KG-1z has additionally on housing 4-pin power connector. In this version the camera can be powered by a hybrid or power connector. Additional, through the electric circuit of camera can power the another intrinsically safe circuit (eg. Intrinsically safe switch type NS-40A produce by HASO).
KG-x is a device of M1 and 2G category and may thus be used in all underground mines with possible methane of coal dust explosion hazard. It can be used by the industry too.

Power supply	Un = 12÷15V DC In ≤ 0,8A
Working temperature	from -10°C to +40°C
Relative humidity range	to 95% without condensation
External dimensions	230 x 75 x 75 mm without sling
Weight	about 2 kg
Casing internal protection	IP-54
Working position	any
LAN transmission parameters (fiber):	100 Mbps (100BASE-FX 100BASE-TX)
Explosion-proof mark	Ex I M1 Ex ia op is I Ma, Ex II 2G Ex ia op is IIB T4 Gb
EC type examination certificate	TEST 14 ATEX 0080X

View from a camera at the bottom of the mine

COMBINE METHANE DETECTOR SET MKO-1X

Combine methane detector set **MKO-1X** is designed to measure the concentration of methane in the area of combine mining work. The set consists of:

- Junction Box GM-1JB/x (main controller),
- Terminal Box GM-1TB (user terminal),
- The Remote Probe R-X (gas sensor),
- Probe cover type OSP-K2.

MKO-1X can operate both in longwall shearers and roadheader. It is designed for continuous operation and it comes in the following versions:

- MKO-11 - powered by 12V DC,
- MKO-12 - with power supply for 24V AC.

MKO-1X is a device of M1 category and may thus be used in all underground mines with possible methane or coal dust explosion hazard.

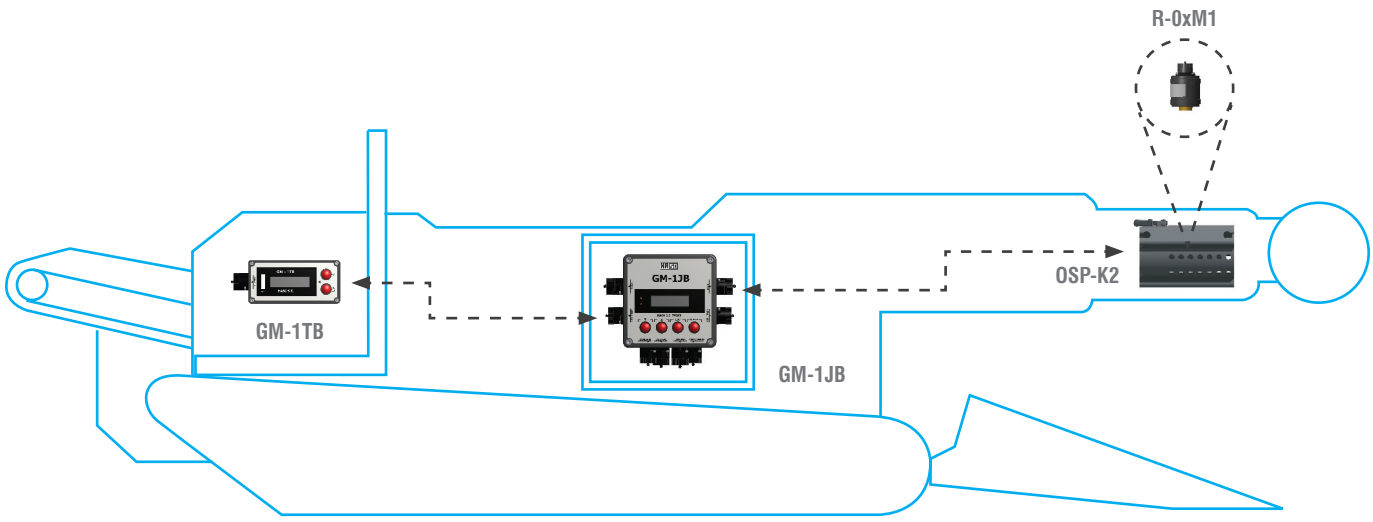
GM-1JB

GM-1TB

R-0xM1

OSP-K2

Power supply	Un = 10V÷16V, In = 500mA (Un = 12V)
Power supply autonomy	10 hours
Measurement method	using attached probe, type R-x
Digital interface	RS422
Analog interface	0-10V/0-5V or 4-20mA
Working temperature range	from -10°C to +40°C
Relative humidity range	to 95% without condensation
External dimensions	GM-1JB/x: 160 x 160 x 90mm; GM-1TB: 75 x 160 x 56mm
Weight	GM-1JB/x: approx 2,5 kg; GM-1TB: approx 1kg
Casing internal protection	IP54
Explosion-proof mark	GM-1JB/x: I M1 Ex ia I Ma; GM-1TB: I M1 Ex ia I Ma
Type test certificate	GM-1JB/x: TEST 14 ATEX 0063X; GM-1TB: TEST 14 ATEX 0062X
Safety Integrity Level	SIL 1 (for configuration I - see manual) or SIL 2 (for configuration II - see manual)



Example configuration of MKO-1X

MOBILE GAS METER GM-1

Mobile Gas Meter **GM-1** is designed to work in all types of mine railways (floor-mounted rail, monorail, diesel-locomotive, battery-powered), longwall shearers, roadheaders and all the other moving machines used in mines. It is designed for continuous operation. GM-1 has four relay outputs. These outputs can be used for driving power switch to machines e.g. in case of exceeding the concentration of methane. Gas meter beside relay (opto-mos) outputs has RS422 interface and analog output (depending on version it can be voltage output 0-10V, 0-5V or current output 4-20mA).
The Mobile Gas Meter system consist of three cooperating types of devices:

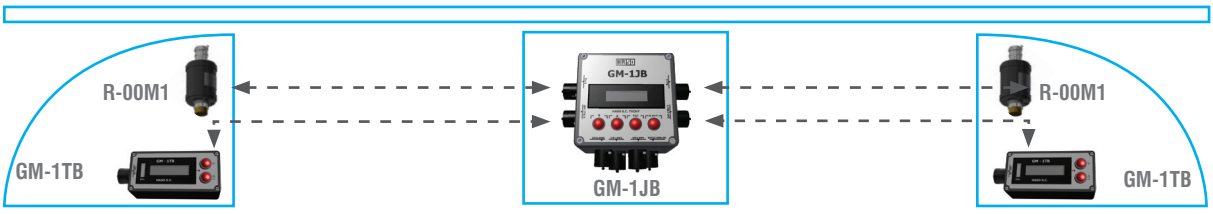
- Junction Box GM-1JB/x (main controller)
- Terminal Box GM-1TB (user terminal)
- The Remote Probe R-X (gas sensor)

The device is equipped with rechargeable battery. In case of power failure the device can operate autonomously for about 10 hours. Mobile Gas Meter GM-1 is M1 category device.

Power supply	Un=10V÷16V, In=500mA (Un=12V)
Power supply autonomy	10 hours
Measurement method	using attached probe, type R-x
Digital interface	RS422
Analog interface	0-10V/0-5V or 4-20mA
Working temperature range	from -10°C to +40°C
Relative humidity range	do 95% without condensation
External dimensions	GM-1JB/x: 160 x 160 x 90mm; GM-1TB: 75 x 160 x 56mm
Weight	GM-1JB/x: approx 2,5 kg; GM-1TB: approx 1kg
Casing internal protection	IP54
Explosion-proof mark	GM-1JB/x: I M1 Ex ia I Ma; GM-1TB: I M1 Ex ia I Ma
Type test certificate	GM-1JB/x: TEST 14 ATEX 0063X; GM-1TB: TEST 14 ATEX 0062X
Safety Integrity Level	SIL 1 (for configuration I - see manual) or SIL 2 (for configuration II - see manual)

Example configuration of gas meter

MONORAIL GAS METER GM-1



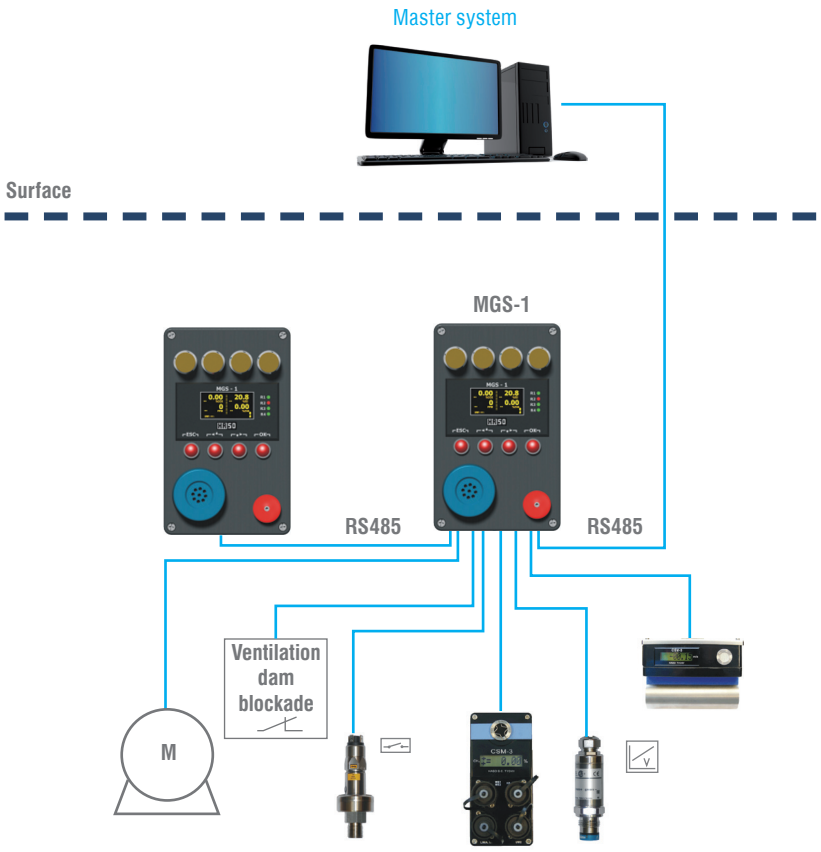
System consists of:
- GM-1JB/x: Gas Meter Main Controller (1 pc)
- GM-1TB: Gas Meter User Terminal (1 or 2 pcs)
- R-00M1: The Remote Probe R-X (infrared methane gas sensor) (1 or 2 pcs)

The above system is an example of a complete configuration, it can be limited to the main controller and the remote probe as shown below.

MULTI-GAS SENSOR MGS-1

Multi-gas sensor **MGS-1** is a stationary devices for measuring gas concentrations and other physical quantities and signaling when the preset alarm thresholds have been exceeded. The sensor has four gas measurement modules configured according to individual customer needs. Measurement modules are able to measure the concentrations of methane (pellistor or infrared method), oxygen, carbon monoxide, carbon dioxide, hydrogen sulphide, sulfur dioxide, carbon monoxide and nitrogen dioxide. Modules can be calibrated in the place of installed sensor thanks to special design facilitates quick installation of calibration dome.
At the front of the cover is placed graphical display. Primarily it is used to show measurements results. Below the display are four buttons for operation of the sensor. You can set alarm thresholds or calibrate the measuring modules. On the front there is also an optical and acoustic siren. They can be switched on after crossing the selected alarm thresholds.

Supply voltage / maximum current	12 V / 800 mA
Measuring range methane (infrared or pellistors methode) oxygen carbon monoxide carbon dioxide hydrogen hydrogen sulfide sulfur dioxide nitric oxide nitrogen dioxide	 0 ÷ 100% CH_4 0 ÷ 25% O_2 0 ÷ 1000ppm CO 0 ÷ 5% CO_2 0 ÷ 1000 ppm H_2 0 ÷ 100ppm H_2S 0 ÷ 50ppm SO_2 0 ÷ 250ppm NO 0 ÷ 20ppm NO_2
External dimension	160 x 260 x 92 mm
Weight	4,5 kg
Casing internal protection	IP-54
Explosion-proof mark	I M1 Ex ia I Ma



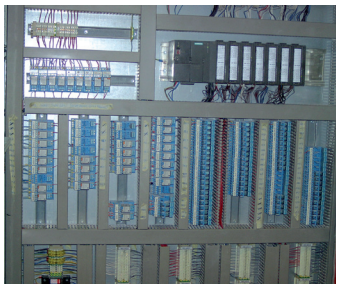
SENSOR APPLICATIONS CHART MGS-1

INDUSTRIAL AUTOMATION

Our offer includes a wide range of control systems and visualization always matched to individual customer needs, including:
- standalone devices built based on our own electronic structures, which may include a microcontroller
- small control systems built based on PLC controller and possibly operator panel
- control and visualization systems containing, among others control cabinets, control station equipped with PCs, remote communication systems, etc.

The proposed solution can provide modernization or expansion of existing control systems, partial or total replacement of the old type of control on modern.
In performing control systems HASO offers:
- development of functional requirements in consultation with the user
- realization of the system design and electrical / electronic design
- completion of delivery devices and components
- realization of cabinets, control boxes,
- installation of actuating devices, sensors and object connection
- software of PLC controllers
- visualization systems SCADA
- development of a complete built documentation
- launch of the system and training of operators
- warranty and post warranty service.

Realizations:



SERVICE

Offer of HASO service includes comprehensive services:
- conducting periodic inspections and repairs of systems and methanometry equipment, during the warranty and post warranty periods
- replacing parts and components of devices which are not suitable for further use
- technical consulting
- installation and commissioning of installed safety systems and devices
- legalization and controlling of blasting equipment
- removing break down of telemetry system CST
- twenty-four-hour service reddiness, seven days a week.