



RESEARCH&PRODUCTION CENTRE  
**PROMELECTRONICA**

- Company
- Systems
- Geography of projects

## About company

### ■ Innovations

Research and production centre “Promelectronica” performs development, production and turnkey supply of railway signalling and telecommunication systems for the main line railway transport, approach tracks for industrial enterprises and metro lines.

*Modern life sets current temp and new tasks. Railways are proceeding, new directions are developed, and traffic speed and volume are increased.*

*Rail transport is strategically important transport, and the need for safety traffic is a constant condition for its development.*

*But how to ensure safety and control level compliant to the defined tasks? It is possible only by means of modern railway signalling and telecommunication systems, which are reliable, suitable and cost-effective.*

*For more than 25 years R&P Centre “Promelectronica” executes development and implementation of microprocessor railway signalling and telecommunication systems. Due to unique technologies, our systems operate in different environment conditions, on sections of any length and traffic density. Today, systems manufactured by R&P Centre “Promelectronica” control train movement and ensure train traffic safety on main lines and tens of large industrial enterprises of Russia, CIS countries, EU and other countries.*

*However, we do not stop on achieved results. Our knowledgebase and experience inspire us on new projects, tasks and developments that are effective for customers and useful for public.*



**Dr. Igor Tilk**  
President, Chairman of the Board



**German Tilk**  
Chief Executive Officer

## About company

We know that every project requires individual and complex approach. These are not simple words, especially in case of construction works on the railway, different track sections and different conditions.

To renovate existing infrastructure, equip completely new object variety of questions, troubles and problems appears at once.

The main principle of our work – to release our customer from these troubles and problems. It is very important not only to develop and offer reliable systems, but to design, construct and train. In other words, it is important to perform an entire complex of works and provide service of high quality.

### **We offer to our customers:**

- complex of railway signalling and telecommunication systems;
- complex of system implementation works;
- support and maintenance of implemented systems.

Innovations, service, quality

## COMPLEX OF RAILWAY SIGNALLING AND TELECOMMUNICATION SYSTEMS

List of research and production programs of R&P Centre "Promelectronica" regularly is updated and contains more than 20 systems and devices. Among our products are:

- soft and hardware complexes for control and train traffic safety ensuring;
- power supply and pulse surge protection systems;
- telecommunication and information systems;
- diagnostic equipment.



## COMPLEX OF SYSTEM IMPLEMENTATION WORKS

### ■ project design works:

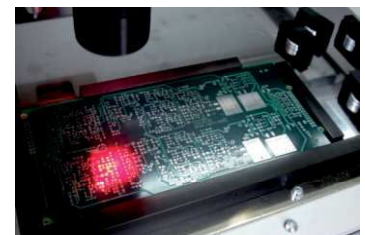
R&P Centre "Promelectronica" is among enterprises that are permitted to design train traffic safety systems for OJSC "RZD". There are over 50 approved standard specifications, design guidelines and engineering solutions for design of our systems.

### ■ equipment supply;

### ■ construction and installation works;

### ■ training of customer's staff:

R&P Centre "Promelectronica" has its own training classes to prepare operational staff for maintenance of supplied systems, training stands with teacher editions as well as issuing video-guides for system maintenance and on-line help programs. Besides, training of staff on site is conducted before commissioning of objects.



## SUPPORT AND MAINTENANCE OF IMPLEMENTED SYSTEMS

- warranty service of systems;
- system operation monitoring, post-warranty service and modernization;
- life-time design supervision of systems.

It is impossible to develop and produce low-maintenance railway signalling and telecommunication systems, to provide implementation and installation as well as service maintenance without further quality improvement (quality of developed products, quality of production, quality of work management and organization).

Quality management system of R&P Centre "Promelectronica" is confirmed by compliance certificate ISO 9000.

All supplied systems are provided with necessary standard technical documentation and have required compliance certificates.

R&P Centre "Promelectronica" consists of engineering and design centers, scientific and research laboratories, manufacturing site, training center.

Specialists of R&P Centre "Promelectronica" use a state-of-art equipment to research and manufacturing and has laboratories to carry out tests for electromagnetic compatibility, mechanical and climatic effects as well as a trial ground.

In 2017 R&P Centre "Promelectronica" has successfully passed the certification audit for compliance with the International Railway Industry Standard (IRIS) and received certificate for the activity of design, development, manufacturing and maintenance of the railway automation and telecommunication systems.

We always progress and improve to make our railway signalling and communication systems be reliable and operate securely.



Method of axle counting of a rolling stock

# Track section control systems using axle counting method



# Axle Counting System ESSO

Axle counting system ESSO is intended for vacancy detection of track sections of any complexity and configuration at stations (including those with shunting operation) and railway hauls.

ESSO operates at any up to zero ballast insulation resistance, including sections with metal sleepers and joints as well as on all-metal bridges.

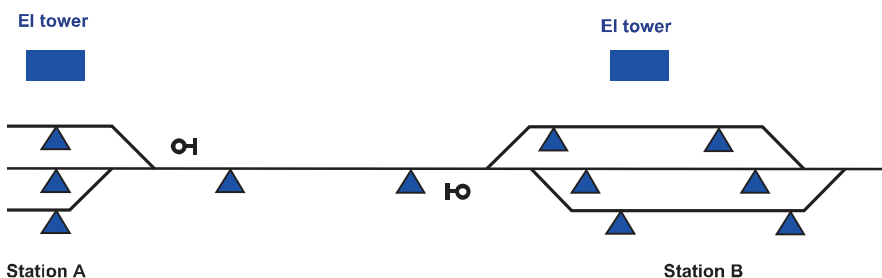
ESSO enables control vacancy of level-crossing approach sections, block-sections with automatic block system, point sections, receiving-and-departure tracks on the stations, point and non-point sections in the systems of hump automatic interlocking, executes control of train arrival in full when semi-automatic block system is used.

There are also available modifications of ESSO for marking of passing axles in hot box detection systems, traffic control and rolling stock type detection systems, positioning of car axles on weight-measuring points.

ESSO is used on the sections with self-traction as well as with electro-traction of any current type.

ESSO equipment is simple-to-install, small-sized and not required of seasonal setup.

- For ESSO quality of communication lines is not so crucial, the system is adapted to the operation in conditions of unsteady power supply. There is no need in using special types of cables.
- ESSO provides connection with any signalling systems and has built-in subsystem for diagnostics and remote monitoring.
- ESSO is certified for the compliance with CENELEC standards and conforms with the highest safety integrity level SIL 4.



## ESSO EQUIPMENT

For all variety of system applications, the same basic nodes are used: trackside and tower devices.

### Trackside equipment of ESSO system:

- trackside electronic module;
- wheel sensor;
- lightning and surge pulse overvoltage protection device;
- wheel sensor claws set.

Trackside electronic module and wheel sensor comprise the counting post, which define movement direction, executes count of passing axles and transmits data to the tower equipment.

### Tower equipment of ESSO system:

- block of receivers, consisting of cassette, tower equipment board and power supply board with data collection system;
- interface unit;
- reset panel;
- uninterruptable power supply unit;
- lightning and surge pulse overvoltage protection device.

Tower devices execute analysis of data on passed over axles and make decision about vacancy or occupancy of track sections. Also, tower equipment performs control of track relay switching-on (switching-off) and as initial information source for microprocessor data collection systems.



Wheel sensor



Track box with trackside electronic module (NEM) and lightning protection device



Block of receivers



## Axle Counting System ESSO

### BASIC TECHNICAL PARAMETERS OF ESSO SYSTEM:

- Ⓞ power supply: uninterrupted 220 V, 50 Hz;
- Ⓜ power consumption per one counting post: not over 10 VA;
- Ⓞ speed for passing axles over wheel sensor: in track section control systems - 0..360 km/h; in automatic switching systems and rolling stock traffic control systems - 0...36 km/h;
- Ⓢ guaranteed data transmitting distance between trackside equipment and interlocking tower equipment: up to 10 km via signal-block cable, up to 35 km via communication cables, and not limited via cable seal-up lines, radio-relay lines and optical fiber lines;
- Ⓣ operating temperature range: from -60 to +85°C;
- Ⓞ for the connection with digital signalling systems interface RS232 is provided using open protocol MODBUS.



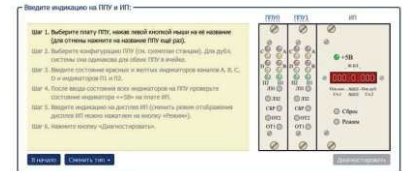
### COST-EFFICIENCY OF ESSO SYSTEM APPLICATION:

- Ⓣ reduction of equipment cost for the track sections in comparison with traditional relay circuits (excluding usage of expensive and copper-bearing elements of track circuits);
- Ⓣ reduction of operational expenses.

Method of axle counting of a rolling stock

**EXTRA SERVICE FOR THE CUSTOMERS – ONLINE HELP GUIDE FOR SEARCH AND REMOVAL OF FAILURES IN OPERATION OF AXLE COUNTING SYSTEM ESSO.**

Due to such help guide, maintenance staff on any failure can enter current indication data and get necessary instructions for its removal.

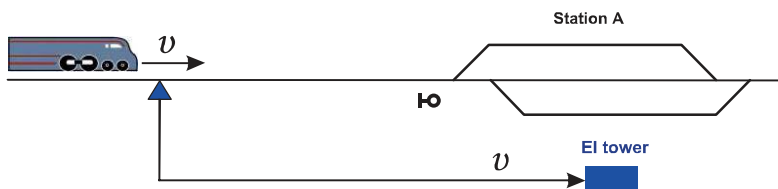


# Speed Control Device

Speed Control Device is based on axle counting method and designed for detection of overspeed of the rolling stock, trains with broken brakes passing with overspeed on the section under the control.

**SPEED CONTROL DEVICE FUNCTIONS:**

- detection of train speed passing over control point;
- control of speed limits.



# Axle Counting System ESSO-M

## GENERAL DESCRIPTION

ESSO-M is a system of new generation and conforms the world trends of railway automation and telecommunication systems development.

Axle counting system ESSO-M is intended for vacancy/occupancy detection of track sections and is alternative to track circuits. It is used on station sections and railway hauls, as well as in metropolitan and speed tram lines.

ESSO-M is integrated into any existing signalling systems both in new construction as well as in the modernization and repair.

ESSO-M enables control sections of any length and configuration. In comparison with ESSO system, it is possible to receive expanded process and diagnostic information, displayed on LCD panel with intuitive interface, such as axles, passed over every counting post with respect to direction, pre-fault state of communication channels with the counting posts.

## ESSO-M EQUIPMENT:

### Wayside devices:

- Wheel sensor DKU with sensor claws.

### Tower devices:

- ESSO-M evaluation block, consisting of case KBR, counting board PLR and interface board PLI;
- axle counter adapter UPSP and interfacing unit USKS;
- ESSO-M visual panel PT;
- reset panel;
- overvoltage protection device.

- **Interfacing with the upper level systems over digital channels; with microprocessor systems via digital serial interface, with relay systems – via integrated safe interface type “dry contact”.**
- **Less equipment in comparison with ESSO – one evaluation block controls 15 sections, wayside equipment is reduced by means of using wheel sensor DKU “Koldun”.**
- **Standard structure enables integration of ESSO-M modules into the standard cabinets of the upper-level system.**
- **Specific UPS is not required.**
- **ESSO-M is certified for the compliance with CENELEC standards and conforms with the highest safety integrity level SIL 4.**



### TECHNICAL PARAMETERS:

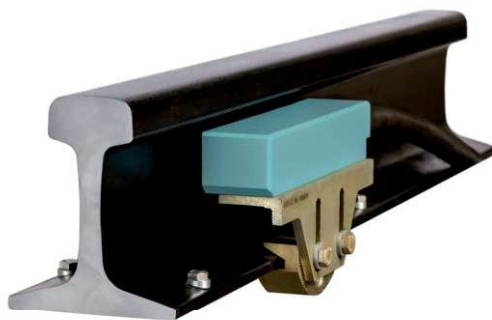
- Ⓢ supply voltage : 220 V AC, 12, 24, 48 V DC.
- Ⓜ max power, consumed by 1 CP: 3.5 W;
- Ⓢ train speed - 0...360 km/h;
- Ⓢ transmitting distance between wayside and tower equipment: over signalling cable- up to 5 km; via communication cables - up to 35 km; seal-up lines, radio-relay lines and optical fiber lines - unlimited;
- Ⓣ outdoor equipment operating temperature range: -60..+70°C; indoor equipment operating temperature range : -40..+70°C;
- Ⓢ diagnostic interfaces: RS-485 (Modbus), Ethernet (SNMP).

### COST- EFFICIENCY:

- Ⓣ reduction of equipment cost for the track sections in comparison with traditional track circuits (excluding usage of expensive and copper-bearing elements of track circuits);
- Ⓣ reduction of operational expenses, including due to fault external relays required periodic maintenance in a part of control instrumentation;
- Ⓢ system operation at any up to zero ballast resistance;
- Ⓢ operational availability increase due to diagnostics of pre-fault states.



*Tower equipment*



*Wheel sensor*

## Wheel sensor DKU “KOLDUN”

### GENERAL DESCRIPTION

Wheel sensor “KOLDUN” is designed for use in information and logistic systems, related to the railway mainline and commercial train traffic.

At present, a full range of logistic and transport problems on the railways is solved by using intelligent optimization algorithms. Information logistic systems provide all round integration of the material flow control elements, their fast and reliable interaction.

Being a primary source of information for these systems, “KOLDUN” detects wheel presence in the area of wheel sensor, performs axle counting with respect to the direction, estimates the parameters of wheel movement and transmits information to the upper level systems.

### DKU “KOLDUN” FUNCTIONS:

- detection of wheel passing, movement direction and wheel speed;
- axle counting with respect to the movement direction;
- transmission of data on wheel presence in a wheel sensor area;
- continuous self-control of workability and position to the rail;
- transmission of received data to the upper level system over communication line;
- ability of remote control.

- **Wheel sensor DKU “KOLDUN”** may be used as detecting element, being a part of information logistic systems in various applications.
- **DKU “KOLDUN”** is used in axle counting system ESSO-M as wayside equipment.
- **Standard structure** enables integration of ESSO-M modules into the standard cabinets of the upper level system.
- **Ability to configure the software** to customer requirements.

### DKU “KOLDUN” BENEFITS:

- wheel sensor itself processes all incoming information, therefore the load on the upper level system is reduced;
- linking with information logistic systems is performed directly without intermediate tower equipment, according to the standard interface RS-485;
- tolerance under the influence of special machines (snow machines, rail lubricating machines, rail cars and etc.).

### TECHNICAL PARAMETERS:

- ⊙ supply voltage: 18 —36 V DC;
- Ⓜ power consumption: not over 3 W;
- Ⓥ wheel speed range: 0... 360 km/h;
- ∅ detected wheel diameter range: 300 —1500 mm;
- Ⓣ operating temperature range : -60... +65° C;
- ⊙ interfacing with the upper level systems via RS-485 using Modbus RTU protocol.



Wheel sensor “KOLDUN”

### APPLICATION



Automatic coupling control systems



Wagon weighing



Warning to operating staff when train entered to working zone



Detection of car types



Measuring of the train speed



Positioning in the hot box detection systems

Centralized traffic control at stations

# Microprocessor Interlocking MPC-I



# Microprocessor Interlocking MPC-I

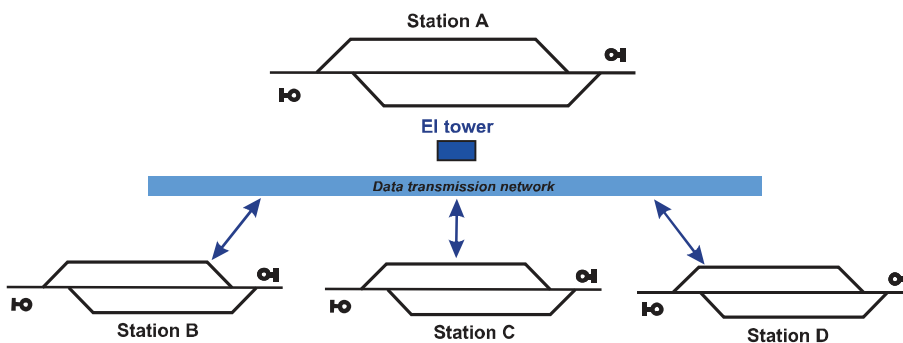
MPC-I executes all interlocking functions, required for safe train traffic control both on single station and on railway section.

- Based on soft and hardware complex of MPC-I it is possible to make common train traffic control center on the section with remote monitoring, integration with CTC and diagnostic-and-monitoring system, connection with radio block centers and development of intellectual functions.
- Program integration is provided by computing complex using client-server structure. Due to that fact, command information systems of any configuration and complexity are developed.

## Hardware and software of MPC-I ensure:

- division of large-scale stations on unlimited number of zones for control (secular and seasonal);
- selection of sections for temporary local control (both with arrangement of additional working place and with control from point tower) on the station with shunting works;
- integration of low-density stations into joint control tower without using facilities of CTC tower and without installation of linear CTC post. Herewith, possibility of local control and monitoring still remains;
- arrangement of multi-level hierarchical control systems as zone-station-section-railroad with possibility of prompt transmission of control to the relevant level if necessary.

- To arrange joint towers and posts, distant working places, centralized sections and other configurations local area networks are used that are created by in-built telecommunication cabinet facilities and channel forming equipment.
- MPC-I executes functions of in-built archival system considering 100% redundancy and independent on operability of any working places and terminals.
- MPC-I is certified for the compliance with CENELEC standards and conforms with the highest safety integrity level SIL 4.





## Microprocessor Interlocking MPC-I

In-built automatic subsystem for measuring insulation resistance, tower voltage and currents enable to use MPC-I system for monitoring of signalling equipment parameters (including remote equipment). Measuring subsystem is implemented depending on the object and based on method of centralized data acquisition by modules of interlocking control unit or distributed data acquisition by special low-sized devices of KID series.

One of important support for design engineers and customers of MPC-I is availability of CAD-software. Due to that, design effort can be reduced in several times, trained staff of the customer can upgrade and make corrections in MPC-I software in case of any changes in the station layout. Besides, safety risks are reduced due to decrease of human factor effect.

In such case, operating organizations are offered two versions of system reconfiguration:

- using project engineering facilities of R&P Centre "Promelectronica";
- self-maintained adaptation within the limits of upgraded part of existing project using MPC-I CAD-software in cooperation with service center of R&P Centre "Promelectronica".

Adaptation of MPC-I is rather easy due to user-friendly CAD interface, even it requires some special knowledgebase and responsibility.

### MPC-I SYSTEM STRUCTURE:

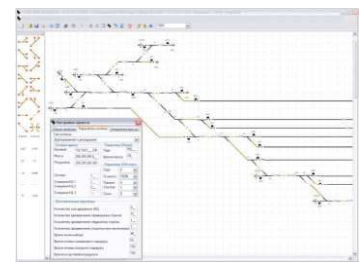
- **station operator work terminal (ARM DSP)** with appropriate user-friendly interface;
- **electrician work terminal (ARM ShN)** for remote monitoring of status of all MPC-I items;



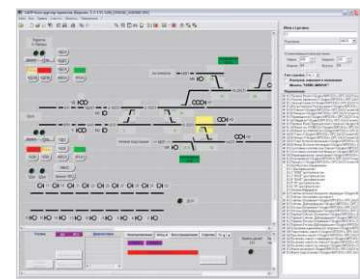
Station operator work terminal ARM DSP



Electrician work terminal ARM ShN



Adaptation of the middle level of MPC-I



Adaptation of the upper level of MPC-I

- MPC-I is one of the most compact interlocking systems executing wide range of functions. If there is no possibility to construct tower building, than MPC-I equipment can be placed in transportable modules and released rooms of existing buildings.

Centralized traffic control at stations

- **main interlocking control unit (UKTs)** with dependence logic program for routing movements over the station. UKTs of redundant system MPC-I is based on method of hot reserve (“2 plus 2”);
- **telecommunication cabinet (ShTK)** provides operability of all working terminals on the station (with full automatic redundancy of all equipment), possibility of simple connection with any external system (including CTC, APCS) as well as information safety, record-keeping and archiving of equipment operation data and staff actions;
- **backup control panel** for directly-wire point switching in case of failures of both ARM DSP and UKTs. Backup control panel is used in simplified version of MPC-I;
- **interlocking facilities** (relay circuit equipment, axle counting, light-signals, electric drives, shunting columns, check station panels and similar wayside equipment produced by Russian plants), signalling cable network, object control units and interface relay schemes for its control.



Main interlocking control unit UKTs

**BASIC TECHNICAL PARAMETERS OF MPC-I SYSTEM:**

- Ⓣ average time period for design of logic (for the station with 30 points): 1-2 weeks;
- Ⓞ number of points per UKTs (one or first UKTs): 35 points;
- Ⓞ number of points per next UKTs: 45;
- Ⓞ overall number of points per interlocking system: unlimited.

**COST-EFFICIENCY OF MPC-I SYSTEM APPLICATION:**

- Ⓣ reduction of equipment in comparison with relay electrical interlocking (EI);
- Ⓣ reduction of expenses on capital construction, installation and maintenance of EI tower equipment due to integration of adjacent signalling systems;
- Ⓞ MPC-I system is unified for application on all small, mid and large-sized stations (road junctions, separate posts and shunting loops) with train and shunting movements of main line and industrial railway transport. It is convenient for design and maintenance of system. Maintenance staff does not require to re-train after overpass to other stations and production period and supply period is substantially decreased as those do not depend on the station size.



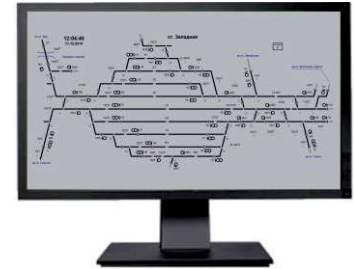
Telecommunication cabinet ShTK



## Centralized control based on MPC-I technology DK-I

Centralized control system (DK-I) performs a remote control of status of the signalling equipment at stations, equipped with microprocessor interlocking system or any relay electrical interlocking. Objects under control are track circuits, track sections equipped with the axle counting system ESSO, points, light signals and other devices that have the original control of status at station.

System is capable to control status of track sections comprising several stations and display information at work terminals (ARM) or via WEB-interface at computers connected to a network of enterprise.



### CHARACTERISTICS AND BENEFITS:

- design in a short period of time using CAD of MPC-I computer system;
- application of standard graphical symbols of MPC-I system allows to show almost all statuses of station objects under control – points, light signals, track sections, power supply installations etc.;
- constant archiving;
- capability to display track section occupancy/vacancy via WEB-interface.

## Insulation resistance measuring controller KID-I Voltage measuring controller KID-N

Controllers operate in fully automatic mode and do not require manual control. Controllers are 8-channel ones. Each controller ensures insulation control (KID-I) or voltage control (KID-N) in 8 electric circuits simultaneously.

KID-N measures DC and AC voltage regardless of signal type in the frequency range from 20 Hz to 5.5 kHz which significantly differ these controllers from Ц4380 devices.

KID-I measures insulation resistance in the range from 1 MOhm to 150 MOhm. In the range below 1 MOhm the measurement inaccuracy is not restricted and KID-I could be applied as indicator.

- KID-I and KID-N can be applied as a part of MPC-I system as well as a part of any other SCADA system which uses RS-485 and Modbus.
- Engineering solutions on application of controllers are developed to use the controllers in MPC-I system or other independent systems.
- In-bult protection against burst interference.



KID-I



KID-N

## Uninterruptable Power Supply System SGP-MS

SGP-MS is intended for centralized power supply of MPC-I equipment or other analogue on the sections with any type of traction or for replacement of old type supply systems.

SGP-MS system executes reception, distribution, conversion and record-keeping of electric energy; protects power supply lines from atmospheric and commutating voltage, short circuits, pulse overvoltage; executes control of electric energy quality, commutation of feeders and electrical isolation of supply circuits.

Different types of SGP-MS enable to select optimal version of power supply system corresponding to the required level of power and redundancy period.

### DEPENDING ON THE TYPE OF SGP-MS, THE SYSTEM CONTAINS THE FOLLOWING UNITS:

power-off and protection switchboard, main distribution cabinet, terminating cabinet, distribution cabinet, transformer cabinet, isolated transformer, uninterruptable power supply unit, rechargeable battery, battery switchboard, automatic load transfer panel.

Uninterruptable power supply (UPS) provides power supply of all trackside and tower equipment on the station.

- Ⓣ power supply backup time: 10 min, 2 h, 4h or 8h;
- Ⓜ nominal load capability of system: 10, 15, 20 or 30 kW.

### COST-EFFICIENCY OF SGP-MS SYSTEM APPLICATION:

- Ⓣ general reduction of operational expenses on maintenance of signalling equipment by means of reliability improvement and using integrity diagnostic facilities;
- Ⓞ uninterruptable power supply enables autonomous operation of station up to 8 hours;
- Ⓞ option to select technology and value-added type of system corresponding to all parameters of object;
- Ⓣ reduction of time for search and removal of failures due to automatic archive support by UPS.

- *SGP-MS system executes all tasks required for reliable, uninterruptable and quality power supply of signalling systems.*
- *The system is provided with standard project documentation.*



## Uninterruptible Power Supply Controller KSGP

### KSGP ENSURES:

- automation of UPS control and improving its technical level;
- safety requirements to signalling and telecommunication equipment of new generation which use uninterruptible power supply.

KSGP is applied in uninterruptible power supply (UPS) as well as in electrical power supply equipment of railway signalling and telecommunication systems with similar functions.

*KSGP on a real-time basis acquires, processes and stores technological data on current state of feeders, DG, UPS and secondary power supply circuits. Upon receiving data, feeders and UPS are caused to pick up the load, DG is started or stopped, signals are generated at discrete outputs. Meanwhile a continuous diagnostics of equipment state is performed and information related to state of monitored and controlled objects, diagnostic results are immediately transmitted to upper level systems and operator's module.*

### KSGP performs the following functions:

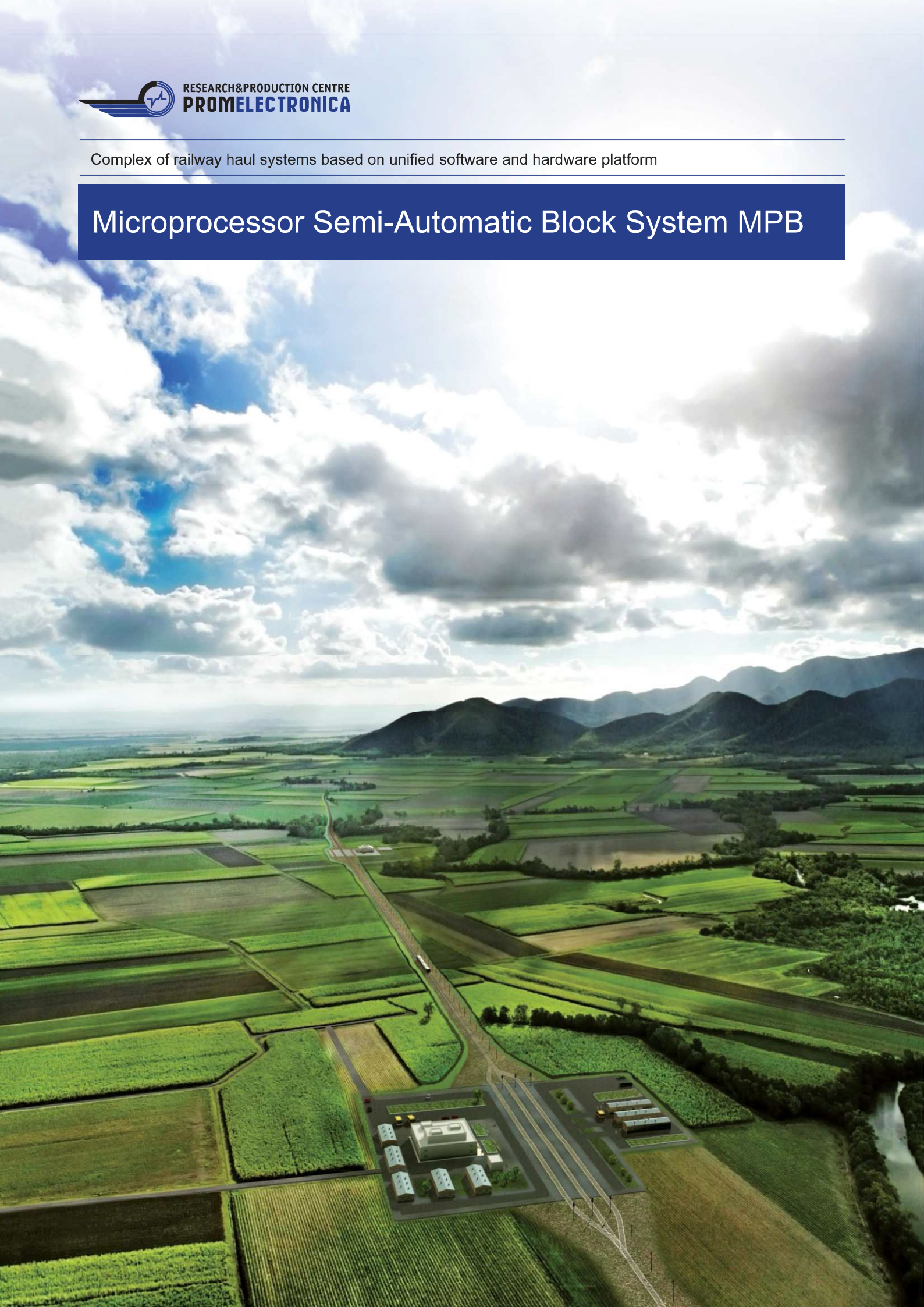
- control of power supply of each feeder to define if it can be caused to pick up the load;
- switching to other feeder or DG if current feeder's parameters are out of tolerable range (parameters of voltage, frequency in each phase, phase rotation, harmonic components in main power supply signal) with regard to delays;
- ensuring two switch modes for feeders with setup: feeder 1 dominance mode and equivalent feeders mode;
- control of UPS power circuits parameters switching defined power circuits to bypass mode not using UPS (applied for VF track circuits at voltage fluctuation or harmonic components in main power supply signal);
- control of secondary power supply sources' voltage and current;
- control of insulation resistance of secondary power supply sources;
- monitoring of various controlled objects using discrete outputs state;
- transmission of diagnostic data to upper level systems;
- control of operator's module parameters

- Controller operates in fully automatic mode and does not require manual control.
- Controller exchanges data with upper level systems via standard interfaces RS-485 (RS-232) and uses Modbus protocol.
- In-built protection against bursts.



Complex of railway haul systems based on unified software and hardware platform

# Microprocessor Semi-Automatic Block System MPB



## Microprocessor Semi-Automatic Block System MPB

MPB is designed for traffic safety assurance on low-density sections and is functional analogue of semi-automatic relay block system (PAB).

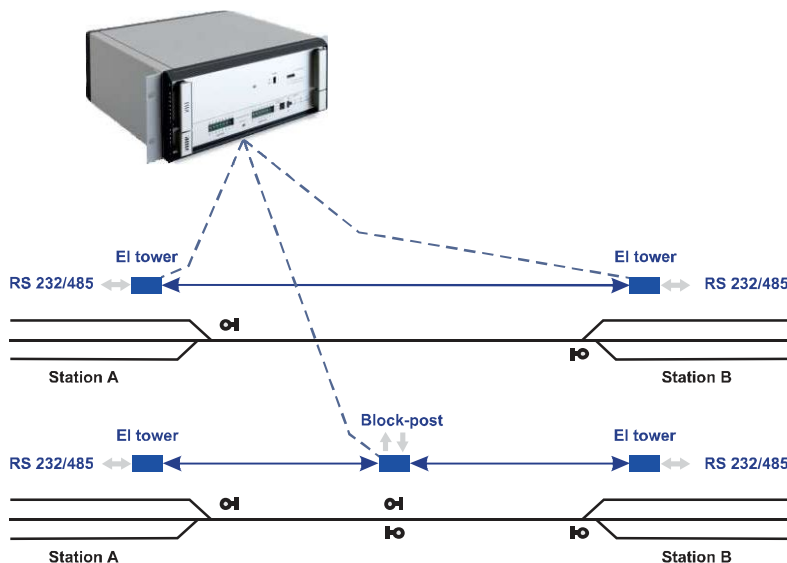
MPB is small-sized, cost-effective maintenance and executes a range of functions:

- semi-automatic block functions supplemented by automatic control of train arrival in full. Control of railway haul vacancy can be performed both by means of in-built facilities (axle counting method using ESSO wayside equipment) and external means of control of track sections;
- arrangement of automatic block-post on the railway haul. Dependence logic for block-post is implemented by MPB control unit not requiring any changes in hardware or software nodes of control unit.

- Basic advantage of MPB over relay analogues is the possibility of block-signals transmission not only via physical lines but also using digital transmission systems as VF-channel multiplexing equipment, fiber-optic lines or radio-channel.
- System ensures automatic redundancy of communication channels.

### MPB EQUIPMENT:

- two similar subsets (block of controllers), located on adjacent to the railway haul stations;
- ESSO wayside equipment (when railway haul is controlled using axle counting method).



### **BASIC TECHNICAL PARAMETERS OF MPB CONTROLLERS' BLOCK:**

- ⊙ supply voltage: 12V or 24V DC;
- ⊙ supply voltage: 16 V AC;
- Ⓜ power consumption: not over 5 VA;
- ⊙ overall sizes: 310x121x266 mm;
- Ⓣ operating temperature range: -60..+85°C;
- ⊙ for the connection with digital signalling systems interface RS232/485 is provided using open protocol MODBUS.



*MPB controllers' block*

### **COST-EFFICIENCY OF MPB APPLICATION:**

- Ⓣ reduction of expenses on capital construction, installation and maintenance of tower devices and relays;
- Ⓣ usage of transmission systems over radio-channel enables to exclude physical line, thereby reduce operational costs and losses due to steal of copper-containing materials;
- Ⓣ conversion of sections equipped with MPB on CTC control.



## Control Unit Base Module BBK-02

BBK-02 is intended for remote monitoring and control of railway signalling and telecommunication equipment with decrease of required communication channel resources and assurance of safety requirements.

### BASIC TECHNICAL PARAMETERS OF BBK-02:

- ⊙ number of digital inputs: 16;
- ⊙ number of digital outputs: 16;
- ⊙ supply voltage: 16 V DC;
- ⊙ supply voltage: 16 V AC;
- Ⓜ power consumption: not over 10 VA;
- ⊙ overall sizes: 310x121x266 mm;
- Ⓣ operating temperature range: -60..+85°C;
- ⊙ for the connection with digital signalling systems interface RS232/485 is provided using open protocol MODBUS.

### COST-EFFICIENCY OF BBK-02 APPLICATION:

- Ⓣ reduction of operating costs for railway signalling and telecommunication equipment maintenance due to diagnostic facilities to check operability;
- Ⓣ decrease of maintenance staff work level;
- ⊕ due to fiber-optic lines, radio-channel, multiplexing equipment there is possibility to arrange remote control of objects without signalling cable or feasibility of its cable laying.

■ Application of BBK-02 enables to arrange remote control of point switch tower and station signal lights.

■ BBK-02 equipment can be used both inside the rooms and in relay cabinets or transportable modules.



BBK-02

Complex of railway haul systems based on unified software and hardware platform

# Level-crossing signalling control systems



## Microprocessor Level-Crossing Protection System MAPS

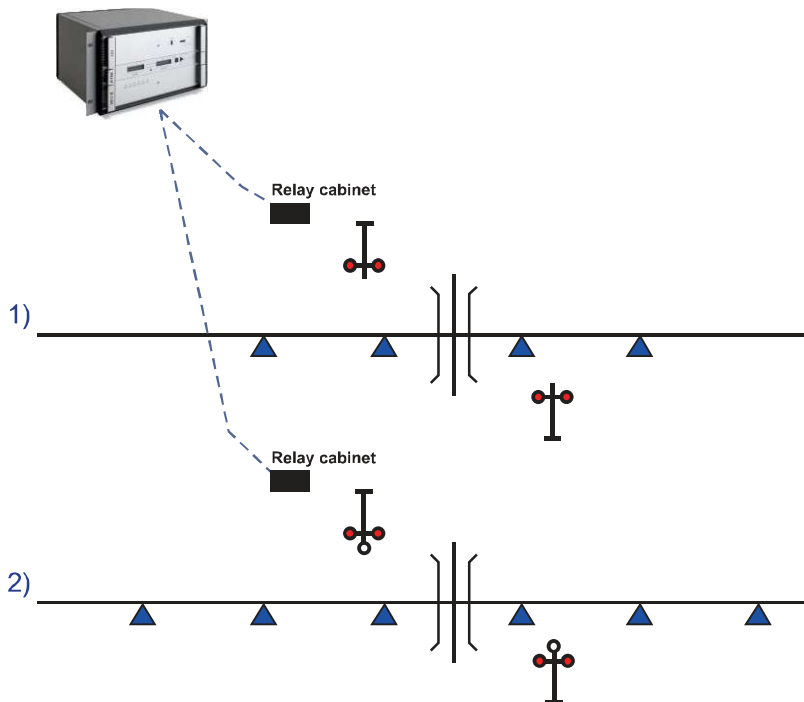
MAPS is intended for construction of new and reconstruction of existing level-crossings and pedestrian crossings of all types.

System enables control of all existing level-crossing signalling devices: level-crossing light-signals, audio signalling, barriers of all types, obstruction devices and signals. Herewith, all set-up dependencies remain unchanged.

System provides alerting and operation of level-crossing signalling executive units by train approaching to the system coverage area on any of monitored track and independent on track specification and block signalling operation. Cancel of alert and level-crossing opening is implemented upon condition that end of a train passed the level-crossing and all alerting sections are free on all monitored tracks.

Level-crossing sections are controlled by wayside units of ESSO.

- *MAPS is low-maintained and simple-to-install block-modular system enable to equip all non-watched and guarded level-crossings located on single-track and multi-track lines with any traffic density.*
- *MAPS can be used with any type of block signalling as well as on the sections without intermittent traffic control system.*



---

Complex of railway haul systems based on unified software and hardware platform

---

## MAPS EQUIPMENT:

- **MAPS level-crossing block;**
- **ESSO wayside equipment.**

MAPS level-crossing block is capable to transmit to the nearest station via VF-channels control and diagnostic data on operability and failures of counting posts, vacancy/occupancy of track sections under the control and status of MAPS block.

Block structure of MAPS enable to execute redundancy of any degree set up by the customer.

MAPS is a highly reliable system performing all the functions when up to two counting posts fail.



*MAPS level-crossing unit*

## BASIC TECHNICAL PARAMETERS OF MAPS LEVEL-CROSSING BLOCK:

- ⊙ supply voltage: from 11 to 36 V DC;
- ⊙ supply voltage: 16 V AC;
- Ⓜ power consumption: not over 15 VA;
- Ⓣ operating temperature range: -60..+85°C;
- ⊙ overall sizes: 310x266x171 mm;
- ⊙ for the connection with digital signalling systems interface RS232/485 is provided using open protocol MODBUS.

## COST-EFFICIENCY OF MAPS SYSTEM APPLICATION:

- Ⓣ reduction of expenses on capital construction, installation and maintenance of tower equipment;
- Ⓣ reduced number of relays;
- Ⓣ non-availability of track circuits enable to reduce operational costs and exclude losses due to theft of copper-containing materials.

Complex of railway haul systems based on unified software and hardware platform

## Non-relay level-crossing Protection system MAPS-M

MAPS-M is a level-crossing automatic signalling system without intermediate relays.

MAPS-M is the first stage of development of non-contact LC signalling system BEKAS, that will allow control of all existing signalling devices on the railway level-crossings of all categories.

### APPLICATION AREA:

MAPS-M is designed for use at level-crossings without operator, located on the single-track or double-track lines equipped with any systems of traffic control.

The system performs automatic control functions of optical and acoustic devices of LC signalling to ensure traffic safety of trains and road transport on crossings.

Control of track sections in the area of MAPS-M is performed by embedded equipment of MAPS system by means of axle counting method.

During operation MAPS-M is located close to the level-crossing in transportable module. Using such module allows fulfillment of MAPS-M climatic requirements and enables improvement of the maintenance staff working conditions.

- *When delivered on site, MAPS-M has a high degree of factory operability and requires minimum installation works under construction.*
- *The main advantages of MAPS-M - complete absence of relay equipment, required routine periodic maintenance; high degree of protection against lightning and switching surges;*
- *Extended diagnostic information and archiving of received data, that enables to detect pre-fault state and significantly reduces the time for troubleshooting.*
- *All process information on the functioning of MAPS-M is clearly displayed on the LCD touch-panel with built-in user-friendly interface.*

### TECHNICAL PARAMETERS:

- ⊙ input for connection of AC power source: 2 inputs (for main and redundant feeders);
- ⊙ supply voltage range: from 198 to 242 V, 50 Hz;
- ⊙ nominal power consumption: not over 350 W;
- ⊙ maximum power consumption: not over 750 W (when charging batteries);
- ⊙ working period in offline mode in absence of external power supply: up to 24 hours;
- ⊙ number of LC signalling system controlled devices:
  - red light —4 devices;
  - moon-white light —2 devices;
  - acoustic signalling units —2 units.
- ⊙ ability of external control and diagnostic equipment connection:
  - output “diagnostic” digital (RS-485) —1 output;
  - output “diagnostic” discrete — 8 outputs.
- ⊙ overall dimensions HxWxD: 2000x800x600 mm;
- ⊙ LED heads and lens sets may be used as optical signalling devices.



MAPS level-crossing unit

### COST - EFFICIENCY:

- lack of relay equipment, required periodic maintenance;
- lack of track circuits reduces operating costs and eliminates losses from theft of copper-containing materials;
- complete prefabricated module reduces the costs for construction and installation works, provides climate system requirements, and also helps to improve the working conditions of service staff;
- due to the lack of schemes, realizing LC signalling relations, expenses for the commissioning and operation are reduced.

## Remote Monitoring System SUMO

SUMO executes archiving of information on operability of controlled devices and systems and emergency alerting of operating staff about failures via cellular channels.

SUMO performs remote monitoring of any equipment supporting protocol MODBUS RTU.

### Functions of SUMO:

- reception of values from internal status registers;
- recording, collection and storage of data on status of equipment using removable media, e.g. SD-card;
- displaying of run status on graphic device;
- alerting about occurrence of pre-set status of equipment via GSM/GPRS using SMS;
- remote access to device via GSM/GPRS for reception of data on equipment status and system itself.

### BASIC TECHNICAL PARAMETERS OF SUMO:

- ⊙ supply voltage, DC/AC: from 10 to 36 V;
- Ⓜ power consumption depends on number of additional modules and equal: not over 15 VA.

### COST-EFFICIENCY OF SUMO APPLICATION:

- ⬇ signalling equipment maintenance according to the current status and as consequence reduction of operating costs.

- SUMO has modular structure and is installed on DIN-rack.
- Power supply is provided from own power source constituting separate module.



Train traffic intermittent control systems

## Microprocessor auto block system with voice-frequency track circuits ABTC-I





## Microprocessor auto block system with voice-frequency track circuits ABTC-I

Microprocessor auto block system with voice-frequency track circuits is designed for interval control and ensuring train traffic safety, including high-speed trains, with any traction type (AC and DC traction, autonomous traction) on single-, double- and multi-track railway lines of all categories.

■ *In ABTC-I high-performance home produced controllers, having in-built self-diagnostic facilities, are used for processing of inter-system data.*

### RELIABILITY AND SAFETY IMPROVEMENT:

- ABTC-I system is based on voice-frequency track circuits without using of insulated joints. Equipment is placed on the stations adjacent to the railway hauls. At every adjacent station ABTC-I system sub-set is placed, which controls a part of the railway haul.
- ABTC-I equipment is based on modern high-efficient microprocessor elements without using electromagnetic relays. Depending on the customer requirements, algorithm of three-digit or four-digit auto blocking is realized in ABTC-I along with a function of logical control of train passing to the railway haul both with intermediate signals and without them.
- ABTC-I provides interaction with relay or microprocessor interlocking, linear points of CTC, receives signals from UKSPS, KTSM, controls LC, bridge, tunnel and crossing signalling system.
- ABTC-I provides interaction with technical facilities, providing duplicated data transmission channel to the locomotive (radio channel).

ABTC-I hardware equipment has functional-modular modification and located in 19" cabinets of Euromechanics standard.



### TECHNICAL PARAMETERS:

- ① length of the railway haul (without intermediate points installed) – up to 30 km;
- ① number of track sections on the railway haul – up to 120;
- ① number of intermediate signals on the railway haul (in both directions) – up to 120;
- ① number of level-crossings on the railway haul - up to 30;
- ① 10 control frequencies of the rail lines in the range from 475 to 975 Hz;
- ① type of control signal modulation – frequency shift;
- ① type of additional protective coding of the rail line control signals – 8-bit modified Bauer code;
- ① track circuit length – from 250 to 800 m;
- ① monitoring of the rail line control signal levels without additional measuring tools;
- ① additional shunting zone – not over 40 m.

### COST- EFFICIENCY:

- ① increase of crossing facility of the railway hauls;
- ② reduction of costs for overhaul construction, installation and technical maintenance; of specific
- ① ability to change carrier frequency of locomotive auto signalling system signal from 25 Hz to 75 Hz to improve channel noise resistance on the sections with AC traction without additional expenses.

*Microprocessor auto block system ABTC-I is a base for train traffic interval control systems using radio channel.*



## Geography of our projects

Nowadays, systems manufactured by R&P Centre “Promelectronica” control train movement and ensure train traffic safety on main lines and tens of large industrial enterprises of Russia, CIS countries, EU and other countries.

### We participated in the following large projects:

- implementation of CTC on the section Urgal —Izvestkovaya of Far- Eastern railway;
  - complex modernization of signalling equipment on Sakhalin railway (RZD);
  - construction of new line Khrom-Tau – Irgiz – Altynsarino in Kazakhstan;
  - complex reconstruction of signalling equipment on Georgian railways;
  - modernization of railway infrastructure on Sumatra, Indonesia;
  - modernization of signalling equipment on section Korotchaevo – Noviy Urengoy of Yamal railroad company;
  - complex modernization of signalling equipment on South-Caucasian railway (RZD);
  - construction of new line Tashguzar – Kumkurgan in Uzbekistan;
  - construction of new speed line Tashkent – Samarkand in Uzbekistan;
  - construction of new line Komsomolsk – Sovetskaya Gavan of Far-Eastern railway (RZD);
  - installation of signalling equipment on the line Tumangan – Radzhin in North Korea;
  - complex modernization of train traffic control systems for MMC Norilsk Nickel;
- modernization of railway infrastructure of such enterprises as PAO Severstal, OJSC Magnitogorsk Iron and Steel works, OJSC Apatit, OJSC NTMK, OJSC Mikhailovskiy GOK, OJSC Pervouralsk pipe plant, OJSC Novolipetsk metallurgical plant, OJSC West-Siberian metallurgical plant and others.

Company

## Contacts

### R&P Centre “Promelectronica”, head office

Address:  
128A Malysheva St.  
Ekaterinburg, 620078  
Russia

Tel.: +7 (343) 358 55 00  
Fax: +7 (343) 378 85 15

*To purchase and implement our systems:*  
Tel.: 8 800 755 50 01 (24 hours, a toll-free number accessible within Russia)

*Service maintenance of systems and equipment:*  
Tel.: 8 800 444 58 58 (24 hours, a toll-free number accessible within Russia)

#### Moscow branch

Tel.: +7 (495) 775 37 35

#### North-west branch

Tel.: +7 (812) 233 27 02

#### Far Eastern branch

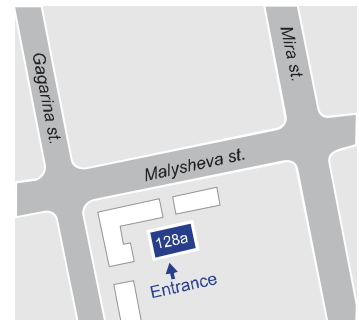
Tel.: +7 (4212) 42 79 81  
Mob.: +7 (912) 632 74 66

#### Branch in Krasnoyarsk

Tel.: +7 (391) 246 04 47  
Mob.: +7 (905) 976 72 63

#### Branch in the Republic of Kazakhstan

Tel.: +7 (771) 295 66 00  
Mob.: +7 (922) 126 97 40



Location of the head office



E-mail: [info@npcprom.ru](mailto:info@npcprom.ru)  
[www.npcprom.ru](http://www.npcprom.ru)

