



Company



Products



Our systems on the map



Research&Development Company

**PROMELECTRONICA**

## About company

Research and Development Company "Promelectronica" develops electronic signalling systems for main lines, industrial railways and subways.

Modern life sets new pace and new challenges. Railway sector is developing and growing, speeds and traffic volumes are increasing, making safety crucial to its development.

But how can we provide high safety and control that correspond to modern challenges? Only by using advanced modern railway signalling technologies – reliable, practical and cost-effective.

For over 27 years the Promelectronica company has been developing and implementing electronic railway signalling systems. Unique technologies allow our systems to work in various operating conditions, at sections of any length and traffic intensity. Today our systems are providing safety in 17 countries: all railways of Russia, CIS countries, Baltic states, European Union, Indonesia, Brazil and South Korea.

However, we are always ready to go extra mile. Our experience and knowledge inspire us to create new projects, set new challenges and researches that are efficient for our customers and useful for society.

## About company

We know that every project requires individual and comprehensive approach. These are not just simple words, especially when talking about construction works on the railway. Every track section has different conditions. Such tasks as renovation of already existing infrastructure, fitting of a completely new facility immediately poses new challenges, problems and concerns.

Our main task is to free our customers of these troubles and concerns. After all, to simply develop and offer reliable systems is not enough, as designing, construction and personnel training are as important. To put it otherwise, we perform an entire complex of works and provide high quality service.

### OUR PRODUCTS AND SERVICES:

- railway signalling systems;
- integration of our systems;
- customer support in Russia and abroad.

## RAILWAY SIGNALLING SYSTEMS

Promelectronica's research and development program is constantly growing and includes more than 30 products:

- software and hardware complexes for ensuring train traffic control and safety;
- power supply and overvoltage protection systems;
- telecommunication and information systems;
- diagnostics equipment.

## INTEGRATION OF OUR SYSTEMS:

- design and survey efforts:

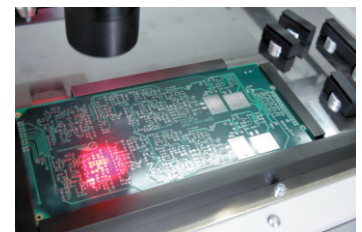
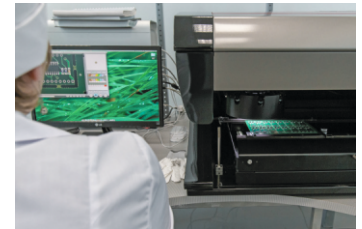
Promelectronica has all permissions for designing train traffic safety systems for the Russian Railways (RZHD). There are over 50 approved standard specifications, design guidelines and engineering solutions for designing of our systems.

- supply of equipment;
- construction and installation works and commissioning;
- personnel training for our customers:

Promelectronica has training rooms to prepare maintenance personnel for operation of our systems, training simulator with printed and video guidelines, as well as interactive help guides. Operating personnel is also trained on-site during commissioning stage.

## SUPPORT AND MAINTENANCE:

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





## Innovations, Service, Quality

We are constantly enhancing the quality of our products and services we provide to supply modern and reliable railway signalling systems to our customers.

We develop and manufacture low-maintenance railway signalling systems, implement and provide the best quality and service to our customers.

Since 2006 we have been working in accordance with ISO 9000 international quality management system.

Our specialists use state-of-art equipment for research, laboratories for electromagnetic compatibility and resistance to climatic and mechanical effects, as well as proving grounds.

In 2018 our quality management system has been certified for a new International business management standard in railway sector ISO/TS 22163:2017 in respect of design, development, manufacturing, implementation and servicing of railway automation, signalling and telecommunication systems and its components.

We continually improve our products to increase their reliability and comply with the growing requirements in the railway sector.



# Axle counting technology for rolling stock



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS



FOR METRO



FOR URBAN RAIL TRANSPORT



## ESSO-M Axle Counting System

ESSO-M Axle Counting System, developed by R&D Center Promelectronica, is intended for vacancy detection of track sections of any complexity and configuration at stations, including ones with shunting operations, and railway hauls.

ESSO technology was initially implemented in 1996 at an industrial railway transport and in 1999 it was implemented on mainline railways.

Our specialists are constantly improving the systems and technologies. New generation of this system ESSO-M was implemented in 2014 on mainline railways, while ESSO-M-2 axle counting system with non-relay integration with signalling equipment was implemented in 2017.

ESSO-M is a new generation in axle counting systems and meets all modern trends in railway signalling equipment.

The system controls vacancy/occupancy of railway tracks and is designed to replace track circuits. ESSO-M is used at station and haul track sections of public and non-public railways, as well as subway and light railways.

ESSO-M may be integrated into any existing signalling systems both when constructing new facilities and modernizing or overhauling already existing ones. ESSO-M is capable of controlling sections of any length and configuration. The system provides more detailed technical and diagnostic information in comparison with ESSO system, which is displayed on LCD panel with user-friendly interface, such as: the quantity of axles that passed through every counting post in any direction, pre-failure conditions of communication channels with counting posts.

### ESSO-M EQUIPMENT:

#### Trackside equipment:

- DKU/DKU-M wheel sensor with sensor clamp.

#### Tower equipment:

- Evaluation unit consisting of KBR evaluator case, PLR counting board and PLI communication board;
- UPSP axle counter adapter and USKS interfacing unit;
- Tower operating terminal;
- PSLZ false occupancy reset panel;
- Lightning and surge overvoltage protection equipment;
- Diagnostics system.

## Rolling stock axle counting technology







- Integration with upper level systems is carried out via modern digital channels, while serial digital interface is used for integration with electronic systems and "potential-free contact" in-built safe interface is used for integration with relay systems.
- ESSO-M uses less equipment than ESSO – one evaluation block is capable of controlling 15 sections. There is also less trackside equipment due to implementation of universal wheel sensor.
- ESSO-M is certified for compliance with CENELEC standards and conforms to the highest safety integrity level SIL 4.







- System does not require electrical adjustments or specialized designing and configuring means.

## Rolling stock axle counting technology

### SPECIFICATIONS:



-  power supply: 220 V AC, 50 Hz;
-  power consumption per counting post: 2 W;
-  Wheel speed - 0..360 km/h;
-  guaranteed data transmission distance between trackside equipment and interlocking tower equipment: up to 5 km via signal-block cable, up to 35 km via communication cables, and not limited via cable multiplexing channels, radio-relay lines and optical fiber lines;
-  operating temperature range for trackside equipment: -60 to +85°C; tower equipment: -40..+70°C;
-  diagnostic interfaces RS-485 (Modbus).

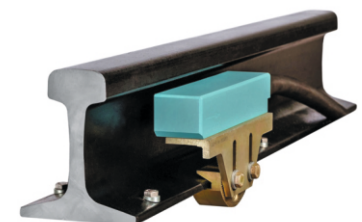
### COST EFFICIENCY:

-  reduction of equipment costs in comparison with traditional track circuits (excludes application of expensive copper-bearing equipment of track circuits);
-  reduction of running costs due to abandoning of external relays that require periodic maintenance by inspection equipment;
-  system works with any, even zero ballast resistance;
-  Increased operating preparedness due to diagnostics of pre-fault conditions.





Tower equipment

-  Standard industrial form factors allow integrating ESSO-M modules into standard upper-level system cabinets.
-  ESSO-M doesn't require specialized uninterruptable power source units.



DKU counting post

-  1 pair of wires is connected to the tower.
-  Does not require electrical adjustment.



## ESSO-M-2 Axle Counting System

ESSO-M-2 is a technologically new system, as it is capable of non-relay integration with existing signaling systems.

The system controls vacancy/occupancy of railway sections and serves as an alternative to track circuits. The system is used at station and haul track sections of public and non-public use, as well as subways.

ESSO-M-2 can be integrated into any existing signaling systems both when constructing new facilities and modernizing and overhauling already existing ones. ESSO-M-2 can control sections of any length and configuration.

### ESSO-M-2 EQUIPMENT:

#### Trackside equipment:

- DKU/DKU-M universal wheel sensor with sensor clamp.

#### Tower equipment:

- Evaluation unit, consisting of KBR evaluator case, PLI counting board and PLR communication board, KLK configuration key;
- UPSP axle counter adapter and USKS interfacing unit;
- PT-2 visual panel;
- diagnostics system.

### SPECIFICATIONS:

- W power supply: 220 V AC;
- safe interface – “potential-free contact” outputs, Ethernet serial protected interface;
- RS-485, Ethernet technological interface.

## Rolling stock axle counting technology

- ESSO-M-2 has better integration reliability with upper-level systems through digital safe protected Ethernet-based interface.
- Functions and interfaces are configurable via software.
- System carries out detailed diagnostics and archiving.



ESSO-M-2 tower equipment



DKU-M counting post



## Solutions for pedestrian crossings and walkways

Pedestrian crossings and pathways at mainline and industrial railways provide safe and convenient crossings.

ESSO-M system, manufactured by Promelectronica, is used to control pedestrian crossing signalling equipment.

The system provides safety at pedestrian crossings located at single and multi-track sections with track circuits or without them.

Axle counting technology is used to arrange a pedestrian crossing: counting posts, connected to ESSO-M system, are located within the boundaries of the pedestrian crossing.

Warning systems are triggered when a train approaches a pedestrian crossing from any direction. After the rear end of a train clears the pedestrian crossing area, set up by counting posts, the system triggers the all-clear signal.

### Rolling stock axle counting technology



## DKU-02 KOLDUN Wheel Sensor

DKU-02 KOLDUN Wheel Sensor is designed for use in mainline and industrial train traffic information and logistics systems.

Nowadays, intelligent optimization algorithms are used to efficiently solve logistical and transport tasks on mainline railways and non-public tracks. Information and logistics systems provide comprehensive integration of control elements with the product flow, immediate and reliable interaction.

KOLDUN is a primary source of information for these systems, as it identifies presence of a wheel in sensing area, counts axels considering their movement direction, calculates wheel movement parameters and transmits information to higher-level systems.

### DKU-02 KOLDUN FUNCTIONS:

- Detection of wheel passing, movement direction and speed;
- Axle counting with detection of movement direction;
- Transmission of information on wheel presence in sensing area;
- Continuous self-control of operability and position relative to a rail;
- Transmission of gathered information to upper-level systems through communication lines;
- Remote control.

### DKU-02 KOLDUN ADVANTAGES:

- Sensor autonomously processes incoming information, decreasing the load on upper-level systems;
- Can be directly connected to information and logistics systems through standard RS-485 interface avoiding intermediate equipment;
- Increased reliability when affected by special vehicles (snow removers, rail lubricators, track carts, etc).

## Rolling stock axle counting technology

- DKU-02 KOLDUN can be used as a recording element in information and logistics systems of any purpose.
- DKU-02 KOLDUN software can be configured in accordance with customer's requirements.

## Rolling stock axle counting technology

### SPECIFICATIONS:

- DC power supply voltage: 18 –36 V;
- **W** Power consumption: max 2 W;
- **V** Wheel speed range: 0... 100 km/h;
- **Ø** Detected wheel diameter range: 300 –1500 mm;
- **t** Operating temperature range: -60... +70°C;
- Integration with upper level systems is carried out via RS-485 interface with Modbus MTU protocol.

### AREAS OF APPLICATION:



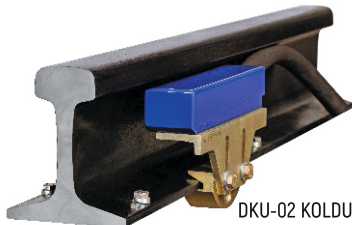
Automatic coupling  
control systems



Train car type identification



Train car weighing



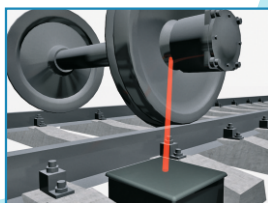
DKU-02 KOLDUN



Rolling stock speed measurement



Warning of operating personnel  
about incoming trains



Positioning in hot box  
detection systems



# Centralized train traffic control on stations



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS



FOR METRO



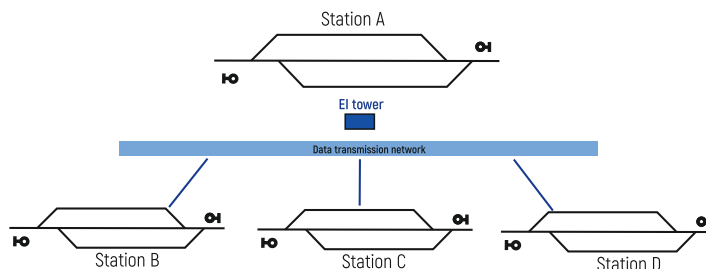
## MPC-I Electronic Interlocking

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

- MPC-I hardware and software complex can serve as a base for single train traffic control center on a section with remote control arrangement, integration with CTC and diagnostic and monitoring systems, integration with radio block systems, development of intelligent functions.
- Software integration is provided by processing complex that uses client-server structure, capable of creating information and control systems of any configuration and complexity.

### HARDWARE AND SOFTWARE EQUIPMENT OF MPC-I ENSURES:

- Division of major stations into unlimited number of control areas (both seasonal and permanent);
- Separation of shunting operation areas on stations for temporary control (both with arrangement of additional work terminal and via switch control tower);
- Integration of low-density stations into joint control stations without using CTC facilities and CTC field stations, at the same time leaving local control capability;
- Organizing of multi-level hierarchic systems with zone-station-section-road control type with capability of immediate passing of control to a relevant level if necessary.



Our company has developed a solution for partial modernization of relay interlocking systems. Similar to electronic interlocking systems, our software and hardware complex replaces control panels with modern ARM DSP at minimal expenses. At that, such an upgrade adds event logging, archiving and possibility to view actions of station masters and station status, as well as provides remote control capabilities.

## Centralized train traffic control on stations

- Local computer networks, arranged by in-build equipment in telecommunication cabinets and channeling equipment, are used to create joint towers, remote work terminals, subdivisions and other configurations.
- MPC-I executes functions of in-built archiving system, structured with 100% redundancy and independent on operability of any work terminals.
- MPC-I is certified for the compliance with CENELEC standards and conforms with the highest safety integrity level SIL 4.



## Centralized train traffic control on stations

In-built automatic subsystem for insulation resistance measurement, tower voltage and currents allows using MPC-I system for monitoring of signalling equipment parameters (including remote equipment). The measuring subsystem is either based on distributed data gathering by specialized compact devices of KID series.

Specialized CAD-software for MPC-I equipment has been developed to assist designers and customers.

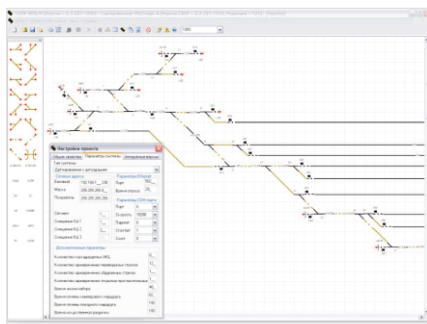
CAD-software significantly reduces design efforts, provides easy and quick adjustment of MPC-I software by authorized trained personnel of a customer in case layout of the station changes. This also minimizes safety risks due to decreased human factor effect.

Operating organizations are offered two versions of system reconfiguration:

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

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

- MPC-I is one of the most compact interlocking systems capable of executing wide range of functions. If there is no possibility to construct a tower building, the MPC-I equipment can be placed in transportable modules or vacated rooms of existing buildings.
- FSTEC (Federal Service on Technical and Export Control) certified and confirmed that MPC-I software is protected against undeclared capabilities and unauthorized access.
- MPC-I is the first Russian-made interlocking system, based on domestic controllers and software.



Adaptation of the middle level of MPC-I



Adaptation of the upper level of MPC-I

## Centralized train traffic control on stations

### MPC-I SYSTEM STRUCTURE:

- ARM DSP automated station master terminal with user-friendly interface;
- ARM ShN automated electrician terminal with remote monitoring over
- MPC-I equipment capability;
- UKC interlocking controller with dependence logic program, designed to carry out routing at the station. Redundant UKC interlocking controller of MPC-I is based on hot redundancy principle ("2 plus 2");
- ShTK telecommunications cabinet. ShTK provides operation of all automated work places on the station (with full automatic redundancy of all equipment), provides simple integration with any external system, including CTC and process control systems, as well as provides information security, protocoling and archiving of equipment and personnel operations;
- Redundancy control panel for point remote control in case both ARM DSP and UKC are rendered inoperable (used in simplified MPC-I variant);
- Interlocking equipment (track circuit equipment, axle counting systems, traffic lights, electric drives, signal boxes, technical inspection panels, and other trackside equipment, mass-produced by factories), signaling cable network, as well as interlocking controllers or interface relay control circuits.



ARM DSP



ARM ShN



UKC



ShTK

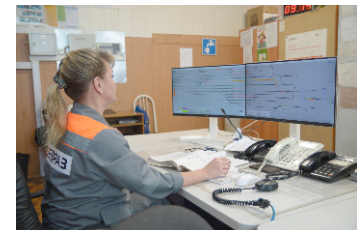
## Centralized train traffic control on stations

### SPECIFICATIONS:

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

### COST EFFICIENCY:

- ↓ MPC-I uses less equipment than relay electronic interlocking systems;
- ↓ Reduced costs for capital construction, installation and maintenance of EI equipment due to integration with adjacent signaling systems;
- MPC-I system is unified for application on all small, medium and large stations (road junctions, separate posts and shunting loops) with train and shunting movements of main line and industrial railway transport, making it convenient for system design and maintenance. There is no need to re-train personnel during transfer to other stations and lead time is substantially decreased as it is not dependent on the station size.





## MPC-I electronic interlocking with object controllers system

Upgraded MPC-I system fully executes all interlocking functions required for safe train traffic control.

Moreover, object controller system provides a set of new functions to this MPC-I variant:

- Decentralized arrangement of equipment on major stations, control over adjacent stations without organizing centralized posts (multistation control system);
- Object control system provides combination of relay interface with centralized control and modern non-relay centralized /decentralized interface;
- Capability to control stations from joint posts without the need to install processing complexes, complex power supply systems and other equipment;
- New MPC-I structured multilevel diagnostics subsystem, which allows immediate detection of fault and pre-fault states.

MPC-I provides several redundancy variants – simplified point remote control panel and full redundancy of interlocking process controllers by 2+2 principle with object controller system both with partial and full redundancy. Redundancy scheme is configurable in accordance with customer's requirements.

### SOK object controller system

SOK provides non-relay control interface for trackside equipment – points and traffic lights. The system transforms logical information received from UKC (for example, signal value or point switch command) into physical information (voltage, current) in accordance with station interlocking object configuration.

Interaction of SOK and UKC is carried out by specialized object communication controller COM FSFB/2 safe protocol is used for interaction.

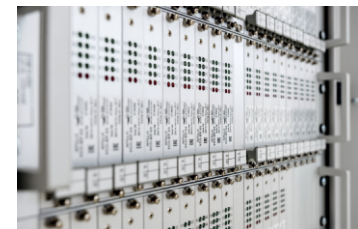
PM point object controllers are designed to control point drives with 220 V AC by using 7-wire communication lines (up to two drives per one object controller). SM traffic light object controllers are capable of controlling up to 8 light signaling systems. Both traffic light filaments and standard LED lights may be used as light signaling system.

IM and OM general input and output object controllers are intended for input and control over other centralized information (for example, for integration with other systems, including relay ones).

## Centralized train traffic control on stations



UKC



## Centralized train traffic control on stations

### FULLY ELECTRONIC MPC-I SPECIFICATIONS:

- ☐ Number of points per UKC featuring SOK object controller system - unlimited (per one UKC);
- ☐ Total number of points in interlocking – unlimited;
- ☐ Nominal power supply voltage – 24 V DC;
- ☐ Number of points per one SOK cabinet – max 24;
- ☐ Number of traffic lights per one SOK cabinet – max 288.

Fully electronic MPC-I system is as cost efficient as MPC-I interlocking.

- Multistation mode allows cutting down costs for comprehensive track section fitting out.
- All MPC-I components are protected against cyber threats by implementation of safe structures and protocols, as well as specialized information protection means located in ShTK cabinet. The system is certified by the NIIS Cyber Security Center.



Telecommunication cabinet ShTK

## DK-I dispatcher control system based on MPC-I

DK-I dispatcher control system is designed for gathering, transmission and displaying of information on train traffic situation and state of signaling equipment on stations. The facility can be equipped with MPC-I electronic interlocking systems, ESSO (ESSO-M, ESSO-M-2) axle counting track section control systems or track circuits.

DK-I system is used to organize single information centers, provide immediate control over transport situation and state of signaling equipment.

All the information gathered by DK-I is used by senior management, station operators and technical personnel at railway facilities.

### FUNCTIONS:

- Remote control over train traffic situation and signaling equipment status at stations;
- Gathering and archiving of information on train traffic situation and signaling equipment;
- In-built insulation and voltage measurement system monitors signaling equipment parameters.

### EFFICIENCY:

- Faster train car turnover due to data hubbing and enhanced control over train traffic situation;
- ↓ Decreased shunting locomotive downtime;
- ↑ Increased control, registry and analysis of rolling stock performance.

### INFORMATION BROWSING IN DK-I:

- In real-time mode on the screen of a station master's terminal or display wall;
- Through WEB-interface on any computer or tablet within the facility's network.

## Centralized train traffic control on stations



- MPC-I CAD-software allows fast development of software for DK-I system.



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

Centralized train  
traffic control on stations

Controllers are fully automatic and do not require manual control. Each controller has 8 channels and provides insulation control (KID-I) and voltage (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, making it the better alternative to Ts4380 instrument.

KID-I measures insulation resistance in range from 1 mOhm to 150 mOhm. If resistance is lesser than 1 mOhm, measurement accuracy is not rated and controller may be used as an indicator.

KID-I and KID-N controllers can be used both as a part of MPC-I and as a part of any other system that supports RS-485 interface and Modbus protocol.

Special technical solutions have been developed to implement these controllers in MPC-I and other independent systems.

Controllers have in-built impulse noise protection.



KID-I



KID-N

## SGP-MS uninterruptible power supply system

SGP-MS is designed for centralized power supply of MPC-I electronic interlocking and other similar systems at track sections with any type of traction, as well as for replacement of old power supply systems.

The system receives, distributes, transforms and records consumption of electric energy; protects power lines from atmospheric, switching and surge overvoltage, short circuits, controls power supply quality; commutates feeders and carries out electric isolation of power supply circuits.

Wide range of SGP-MS variants allows choosing optimal one that corresponds to required power capacity and redundancy time.

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

Power-down and protection switchboard, input and distribution cabinet, input cabinet, distribution cabinet, transformer cabinet, isolating transformer, uninterruptible power supply unit, accumulator battery, battery power-down switchboard, automatic redundancy power-down switchboard.

Uninterruptible power source provides power supply to all trackside and tower equipment of a station.

- T Power supply redundancy time: 10 minutes, 2 hours, 4 hours or 8 hours;
- W Nominal load capacitance: 10, 15, 20 or 30 kW.

### SGP-MS COST EFFICIENCY:

- ↓ General reduction of running costs for signaling equipment maintenance due to increased reliability and implementation of diagnostics equipment;
- Stable and uninterrupted power supply, capable of providing autonomous operation of a station for up to 8 hours;
- Ability to select technologically and economically viable option that corresponds to facility's requirements;
- ↓ Reduction of specified time for troubleshooting due to automatic UPS system archiving.

## Centralized train traffic control on stations

- SGP-MS provides reliable, uninterrupted, high-quality power supply to signaling equipment.
- The system is provided with standard designing documentation.



## MPC-I laboratory training set

A special lab complex has been created for training of station masters to operate MPC-I interlocking system.

The training set is designed to control a mockup of a station and includes the following equipment:

- Interlocking controller cabinet (UKC);
- Relay-contact interface rack;
- SGP-MS power supply unit;
- Station mock-up comprised as redundant operator's desk
- Automated work terminals of a station master (ARM DSP) and electrician (ARM ShN).

Training features simulation of live situations, such as setting up and route releasing, pulling down signals, point switching, arrival of a train to a station, as well as search for and troubleshooting of possible failures.

## Centralized train traffic control on stations



## Station master training set

Station master simulator is based on MPC-I software, which includes work terminal and specialized software “MPC-I simulator”.

Station master simulator is designed for training of station masters before station commissioning and scheduled training. Station master’s terminal has the same set of equipment and dimensions as the electrician’s terminal, which is included into MPC-I. Compact size of the simulator allows locating it in buildings of stationmasters, classrooms, etc. The simulator is powered by 220 V AC.

Station Master simulator with MPC-I software simulator allows training station operators for a particular station. Mnemonic station layout on the screen of station operator terminal simulator and user interface fully corresponds to ARM DSP of a particular station.

Station master simulator allows station masters to train operating principles of MPC-I in basic control mode, at that the training includes:

- Signing-in and user authorization;
- Procedure for setting up and cancelling of routes;
- Point switching;
- Calling-on signal opening;
- Supplementary point switching;
- Division of sections;
- Operating procedures for a station master in case of point failure or false occupancy;
- Procedure of receiving trains under equipment failure conditions.

## Centralized train traffic control on stations





## PARUSS Underground autoblock, speed, point and signal control electronic interlocking system

### Centralized traffic control at stations

PARUSS is a modern safe train traffic control system for subways. The system organizes centralized station operator point and signal control, redundant local point and signal control, included into control area, processing of train routes and train separation on control station.

#### SPECIFICATIONS:

- Train traffic control with schedule of at least 48 trains per hour;
- Capability of shunting operations on branched stations, connecting lines and depot tracks;
- Number of logical control objects (block-sections, points, lights, etc) – min 1,000;
- Number of tele signalling and telematics signals – min 3,000;
- Full system operating cycle – max 0.5s;
- Ability to fully control system devices locally both from main terminal ARM-DSCP and redundant ARM-DSCPR.

#### ADVANTAGES:

- Integrity of safe train traffic control due to hardware integration at control subsystem level;
- Decrease of capital and running costs;
- Reduction of mass-dimensional parameters and system power consumption;
- Analysis of faults, automatic control over system state, storing of technological data;
- Automatic logging and storing of information on actions of maintenance and operation personnel;
- System flexibility due to application of modern solutions based on industrial controllers.





# Railway hauls control



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS





## MPB electronic semi-automatic blocking system

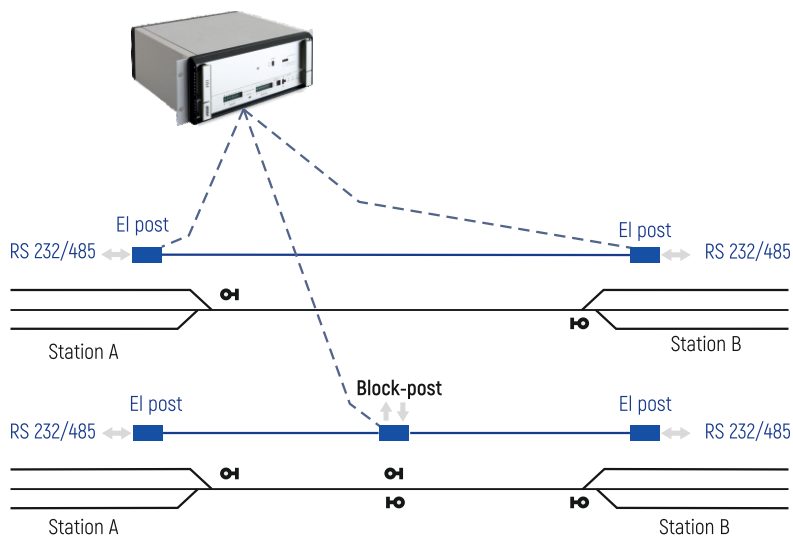
MPB electronic semiautomatic block system is designed for ensuring safety at low-density sections and serves as a functional alternative to relay semiautomatic blocking.

MPB is compact, efficient and has a wide range of functions:

- carries out semiautomatic block system functions to ensure arrival of a train in full. Vacancy control can be carried out both by in-built means (ESSO axle counting system) and external track section control systems;
- arrangement of automatic block-post on a railway haul. MPB dependence logic for block-post does not require any adjustments in hardware or software nodes.

### MPB EQUIPMENT:

- Two similar subsets (blocks of controllers), located at stations adjacent to a haul;
- ESSO trackside equipment (if track section is controlled by axle counting system).



## Railway hauls control







- The main competitive advantage of the MPB microprocessor semiautomatic autoblocking system over relay systems is the capability of transmission of block-signals not only via physical communication lines, but also via digital data transmission systems – audio-frequency multiplexing equipment, fiber-optics lines, radio channel.
- The system provides automatic communication channels reservation.






MPB block of controllers

## Railway hauls control

### SPECIFICATIONS:

-  DC voltage: 12 or 24 V;
-  AC voltage: 16 V;
-  Power consumption, max: 5 VA;
-  Dimensions: 310x121x266 mm;
-  Operating temperatures range: - 60°C ... +85°C;
-  Integration with modern digital signalling equipment is carried out via RS232/485 interface with open MODBUS protocol.

### COST EFFICIENCY:

-  Reduction of costs on capital construction, installation and maintenance of tower equipment and relays;
-  Transmission via radio channel excludes physical communication lines, reducing running costs and losses due to theft of copper-bearing materials;
-  Capability to convert MPB controlled track sections to CTC.



## ULIS MPB laboratory training set

ULIS MPB is designed for examining electronic automatic blocking in railway education facilities, as well as advanced training courses for RZhD staff and industrial railway transport that maintains the system.

Structurally the device is comprised of a rack with MPB station equipment and display of trackside equipment, which represents a training mockup of a one-way haul adjacent to two stations with automatic block-post.

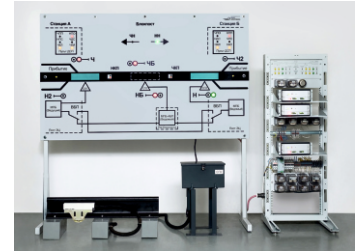
Besides trackside equipment, the display also has indicators of station master console, entrance, exit and intermediate lights of a block-post, buttons for simulation of train arrival to a station, as well as schematic lines for transmission and exchange of information between MPB blocks and connected devices.

Counting post is placed outside the ULIS display and is installed on a segment of a track panel for visual demonstration of MPB equipment allocation under actual operating conditions.

### ULIS MPB ALLOWS LEARNING:

- The principle of receiving and departing trains;
- MPB configuration means;
- Indication and control means for normal operation mode;
- Indication and control means for malfunction operation mode.

## Railway hauls control



## BBK-02 Base Controller Block

BBK-02 is intended for organizing remote control over signalling equipment, minimizing requirements for communication channel and assuring train traffic safety.

### BBK-02 SPECIFICATIONS:

- number of digital inputs: 16;
- number of digital outputs: 16;
- DC supply voltage: 12 or 24 V;
- AC supply voltage: 16 V;
- power consumption: max 10 W;
- overall sizes: 125x315x275 mm;
- operating temperature range: -60..+85°C;
- Integration with modern signaling equipment is carried out via RS232/485 interfaces with open MODBUS protocol.

### BBK-02 COST EFFICIENCY:

- Reduction of running costs on signalling equipment maintenance due to implementation of diagnostic equipment;
- Reduced load on operating personnel;
- Fiber-optic lines, radio channel, multiplexing equipment provide remote control capabilities if there is no signalling cable or its installation is not feasible.

## Railway hauls control

- Application of BBK-02 allows arranging remote control over point switch tower and station signal lights.
- BBK-02 equipment can be used both inside the rooms and relay cabinets or transportable modules.



BBK-02

# Solutions for level-crossings



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS



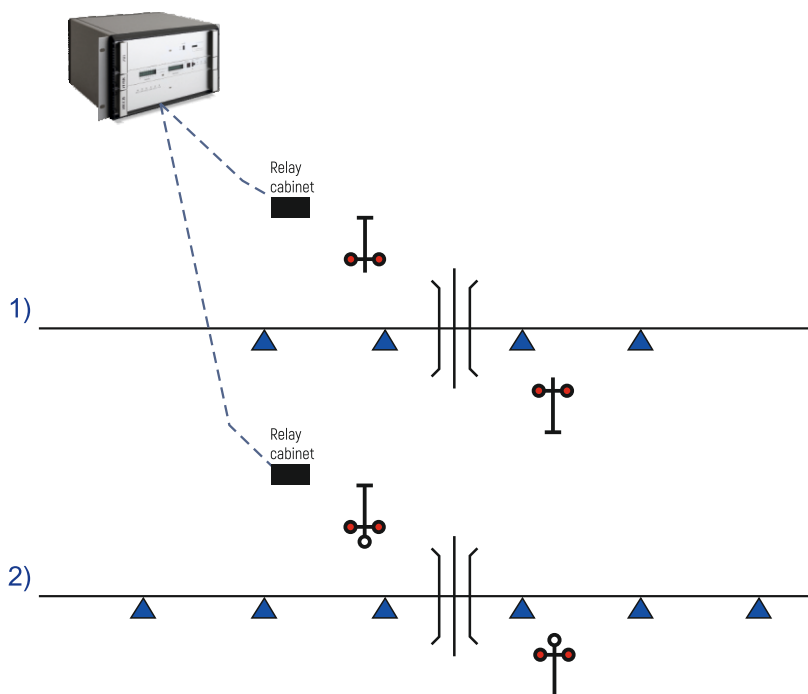
## MAPS automatic level crossing control system

MAPS is used for designing of new and overhauling existing level crossings and pedestrian crossings of all types.

The system allows controlling all level crossing signalling equipment: traffic lights, sound alarms, barrier arms, blocking devices and protection signals, keeping all set dependencies unaltered.

MAPS triggers alarm and controls actuation of level crossing devices upon approaching of a train to controlled area regardless of track specialization and blocking type. Opening of the level-crossing and alert systems shutting off is performed when the rear end of the train clears the level crossing area and the rail track is vacant on all controlled track sections.

MAPS system uses axle counting technology to control level crossing sections.



## Safety at level-crossings

- MAPS is a low-maintenance, easy-to-install modular system, which is designed to control both non-monitored and monitored level-crossings and pedestrian crossings, located at single and multitrack hauls with any traffic intensity, including on warning sections, which are the part of the station track.

MAPS is suitable for any type of block signalling and track sections without intermittent traffic control systems.



MAPS level-crossing block

- Simple adaptation at increase of maximum speed on section.
- Capability to view diagnostic information and event logging.

## Safety at level-crossings

### MAPS EQUIPMENT:

- MAPS level-crossing block;
- ESSO/ESSO-M wayside equipment.

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

MAPS is a highly reliable system and is capable of performing all the functions even at failure of two counting posts.

### MAPS SPECIFICATIONS:

- DC voltage: 11 – 36 V;
- Nominal power supply: 12 or 24 V;
- **W** Power consumption (excluding tower equipment) max 15 W;
- **t** Operating temperature range: -60°C - +85°C;
- Dimensions: 315x175x275 mm;
- Integration with modern digital signalling equipment is carried out via RS232/485 interface with open MODBUS protocol.

### COST EFFICIENCY:

- **↓** Reduced costs on capital construction, installation and maintenance of tower equipment;
- **↓** Relay quantity reduction;
- **↓** Absence of track circuits reduces running costs and excludes losses due to theft of copper-bearing equipment.

## MAPS ULIS laboratory training set

ULIS MAPS is designed for examining principles of operation of MAPS automatic level crossing block system and comprises a training mockup of one-way guarded level-crossing equipped with light signalling with lunar white signal.

Structurally the laboratory testbed consists of the rack with MAPS station equipment and MAPS trackside equipment display.

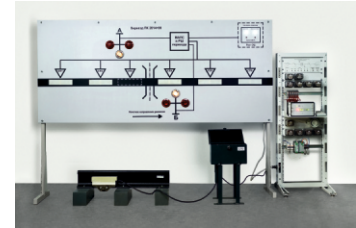
ULIS MAPS display demonstrates single level railway crossing layout. Besides trackside equipment, the display has level crossing lights, haul state indicators and schematic illustration of data transmission and exchange channels between MAPS devices.

Counting post is placed outside the display for better visual demonstration of MAPS trackside equipment arrangement under actual operating conditions. Wheel imitator is used to simulate passing of a train through level-crossing counting posts.

### ULIS MAPS ALLOWS LEARNING:

- Principle of controlling vacancy/occupancy of arrival and departure track sections;
- MAPS configuration means;
- Indication and control means for standard operating conditions;
- Indication and diagnostics of equipment during malfunctions.

## Safety at level-crossings



## MAPS-M non-relay automatic level crossing

MAPS-M is a non-relay automatic level crossing signalling system.

### AREA OF APPLICATION

MAPS-M is designed for application on non-monitored level crossings at single or double-track hauls, equipped with any type train of traffic control systems. The system carries out control over visual and audio warning equipment at level crossings to provide train and car traffic safety. MAPS-M controls train track sections via axle counting technology embedded into MAPS automatic level crossing signalling control system.

MAPS-M is located in close vicinity to a level crossing in a transportable container, as it provides necessary climactic requirements for MAPS-M, as well as better work conditions for personnel.

### MAPS-M SPECIFICATIONS:

- AC power supply inputs: 2 inputs (for main and redundancy power supply feeders);
- Power supply voltage range: 198 to 242 V, 50 Hz;
- Nominal power consumption, max: 350 W;
- Maximum power consumption, max: 750 W (when charging accumulator batteries);
- Autonomous operation if external power supply is down: up to 24 hours;
- Number of controlled level crossing signalling equipment:
  - Red light – 4 devices;
  - Lunar-white light – 2 devices;
  - Sound alarm – 2 devices;
- Capability to connect control and diagnostics equipment:
  - RS-485 digital diagnostics output – 1 output;
  - Discrete diagnostics output – 8 outputs;
- Dimensions HxWxD: 2025x800x700 mm;
- LED lights and lens sets may be used for visual signaling.

### MAPS-M COST EFFICIENCY:

- Full absence of relay equipment that requires scheduled maintenance;
- Absence of track circuits reduces running costs and excludes losses due to theft of copper-bearing elements;
- Prefabricated module reduces construction and installation costs, as well as provides climatic requirements for the system and better work conditions for personnel;
- Commissioning and running costs reduced due to absence of level crossing signalling dependency schemes.

## Safety at level-crossings



MAPS-M system

- MAPS-M is supplied in ready-to-use state and requires minimum installation efforts during construction.
- One of the main advantages of MAPS-M is full absence of relay equipment, which requires scheduled seasonal maintenance by control equipment; the system is also equipped with lightning and surge overvoltage protection; detailed diagnostic information and archiving of received data, which allows identifying pre-fault states and significantly cutting down on troubleshooting times.
- Technological information about MAPS-M performance is displayed on LCD-panel with user-friendly interface.



# Train traffic control



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS





## ABTC-I electronic auto block system with audio frequency track circuits

ABTC-I electronic auto block system with audio frequency track circuits is designed for train separation and ensuring traffic safety, including on high-speed mainlines, sections with any type of traction.

### INCREASED RELIABILITY AND SAFETY:

- ABTC-I auto block system uses audio frequency track circuits, without insulating joints. Equipment is located on stations, adjacent to a haul. Every adjacent station has ABTC-I sub-assembly that controls a designated haul section.
- ABTC-I equipment is based on high-performance microprocessor elements that do not use electromagnetic relays. Dependent on customer's requirements, ABTC-I is implemented with 3 and 4-digit auto-block algorithms, automatic cab-signalling both with individual train separation system (ALSO) and train separation system with mobile block-sections.
- ABTC-I provides interaction of:
  - electronic, relay-electronic and relay interlocking system of points and traffic lights;
  - CTC, dispatcher control systems;
  - automatic level-crossing alarm systems, alarms at pedestrian crossings;
  - alarm and barrier systems on bridges, derailing systems.
- ABTC-I provides interaction with technical means that duplicate data transmission channel to a locomotive (via radio channel).

ABTC-I equipment is modular and placed in 19" Euromechanics standard cabinets.

### Train traffic control

- ABTC-I uses domestic high-performance controllers with in-built self-diagnostics equipment.



## Train traffic control

### SPECIFICATIONS:

- ☐ Length of haul (without intermediary points) – up to 30 max;
- ☐ Track circuit length – 250 to 800 m;
- ☐ Number of traffic lights on a haul (in both directions) – up to 120;
- ☐ Track circuits with carrier frequencies in range from 475 up 50 925 Hz with 50 Hz step is used for rail line control;
- ☐ Track circuit length – from 250 to 800 m;
- ☐ Coding of track circuits by ALSN and/or ALS-EN signals;
- ☐ Can be used both with lamp and LED light signals;
- ☐ In-built control of cable circuits, leading to trackside equipment;
- ☐ Monitoring of all rail line control levels without application of additional measuring tools, capability to transmit monitoring information to diagnostic and monitoring systems.



### COST EFFICIENCY:

- ☐ Increased track capacity of single, double and multi-track hauls;
- ☐ Reduced costs on capital construction, installation and maintenance;
- ☐ Capability to change ALSN signal-carrier frequency from 25 to 75 Hz without increasing immunity on track sections with AC electric traction without additional expenses.

ABTC-I electronic auto block is one of the stages of radio channel intermittent train traffic control system development.

# Solutions for equipment arrangement



FOR MAINLINE RAILWAYS



FOR INDUSTRIAL RAILWAYS



## MKM Equipment container module

MKM is designed for installation of technological equipment of railway signalling equipment and work of personnel in any operating conditions 365/7/24.

### MODULE IS USED IN THE FOLLOWING CONDITIONS:

- If there is no vacant building for equipment;
- If installation of equipment in a building is not feasible.

MKM is a turnkey solution – everything including manufacturing of a module and its internal equipment and installation and commissioning.

MKM module is a finished product with in-built high-tech life support system.

### MKM module is equipped with the following systems:

- Main and emergency lighting;
- Fire and burglar alarm;
- Fire suppression system;
- Ventilation system;
- Environmental control system;
- Heating system;
- Access control system.



- Module is manufactured with consideration of operating climactic conditions. For example, if a module is intended to be installed in low temperature climates, a wind-hall is installed.
- Module sizes are configured by a customer. They depend on size of the station and quantity of required equipment.
- MKM modules can be assembled into complexes. Complexes may be disassembled if necessary and reinstalled at another location without disassembly of internal equipment and additional inspections.

#### COST EFFICIENCY:

- ↓ Reduction of costs on capital construction and connection to utilities;
- Lead time – 12-16 weeks;
- Delivered on site in ready-to-use state;
- Single warranty for the whole complex (MKM module and signalling equipment);
- Solution can be scaled at any time;
- Round-the-clock customer support;
- Can be delivered on site by any mean of transportation.

#### SPECIFICATIONS:

- Sealed housing;
- t MKM operating temperature range - -60°C up to +50°C;
- t Temperature range inside MKM module - +5°C - +25°C;
- Whole solution may be scaled if necessary;
- N+1 redundant environmental control;
- HFC-227ea gas fire extinguishing agent;
- Best IP protection in railway sector.

- Average on-site installation time – 2 hours. 4 base jacks provide easy on-site adjustment.
- Meets GOST R 51321.1-2007 (MEK 60439-1:2004) requirements.
- MKM module provides comfortable work conditions for operating personnel.



MKM module has been tested in Extreme North conditions and is used on stations located beyond the Arctic Circle.

## Our projects in the world

### WE TOOK PART IN THE FOLLOWING PROJECTS:

- Comprehensive renovation of signalling equipment at Urgal – Izvestkovaya section on Far Eastern Railway;
- Comprehensive renovation of signalling equipment at Sakhalin Railway;
- Construction of new railway line Khromtau – Yrgiz – Altynsarino in Kazakhstan;
- Renovation of signalling equipment on section between Korotchayev – Novy Urengoi for Yamal Railroad Company;
- Overhaul of signalling equipment at South Caucasus Railway;
- Construction of new railway line Tashguzar – Kumkurgan and high-speed line Tashkent – Samarkand in Uzbekistan;
- Construction of railway between Komsomolsk – Sovetskaya Gavan on Far Eastern Railway;
- Supply of signalling equipment to section Tumangan – Radzhin in North Korea;
- Comprehensive renovation of traffic control systems at PAO GMK Nor Nickel;
- Upgrade of railway line Plovdiv – Burgas for Bulgarian Railways;
- Upgrade of railway infrastructure in Indonesia;
- Renovation of railroad facilities of such enterprises as PAO Severstal, PAO FosAgro, EVRAZ, PAO Gazprom, PJSC MMK, PAO Lukoil, AO MKhK EvroKhim, OAO SUEK, PAO NLMK and others.









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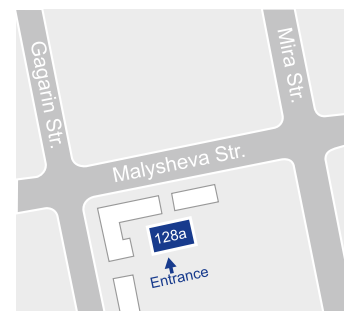
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