About Company

We independently carry out the development, design, manufacture, installation and commissioning of power-generating equipment and its technical and service maintenance

△ Experience. We are active on the energy market since 1991
△ Innovations and advanced technologies
△ Our devices installed in 26 countries all over the world
△ Confidence of leading companies:
  Gazprom, Rosseti, Lukoil, Tatneft,
  Surgutneftegaz, Tagraz holding
△ High quality standards
△ Sustainable growth
Specialized

- Fault indicators for Overhead Lines
- Short-Circuit and Earth Fault Indicators
- Cable fault locator
- Communication units
- Distribution network monitoring system
- Control and monitoring devices for substation equipment
Intelligent Management System

There are two parts of intelligent management system: OHL and substation equipment:

- The monitoring and management complex for overhead line networks based on Lodestar

- The system of equipping substations with telecontrol systems and feeder monitoring devices with emergency processes localization functionality
Online Grid Monitoring

- Monitoring is a process of on-line continuous overhead and underground lines control in order to obtain timely information about emergency and other processes occurring in the line.
- Multifunctional device for localization of all types of faults in overhead line and underground cable networks with any type of neutral grounding.
- Grid feeder monitor aimed to work in any type of networks including closed ring lines.
- Online monitoring reduce your OPEX with automated, detection and analysis of troubles and accurate dispatch of crews.
- Complex monitoring implies obtaining information from various points of the network from intelligent fault indicators.
- The management is performed by means of system retrofitting with remotely controlled switches and disconnectors.
Resolves main problems of power distribution network

6-35 kV networks specialities

- Low level of networks automation
- Low networks observability
- Poor controllability
- Insufficient equipment with ASCAPC*

Last implementations

- Improvements of SAIDI and SAIFI reliability indexes
- Prompt localization of a fault location
- Energy undersupply reduction, on-line management
- Control of unauthorized electricity outfeed

ASCAPC – automatic system for commercial accounting of power consumption
Lodestar systems in the World

- Smart Grid (Ufa) - substation automation system
- Grid company (Tatarstan) - automation system for PDZ*
- Bashkirenergo - automation system for 7 PDZs
- Romande (Switzerland) - monitoring system for PDZ
- Tenago Nasional Berhad (Malaysia) - monitoring system for PDZ

PDZ – power distribution zone
Short-Circuit and Earth Fault Indicator IKZ-K4

Installation in a switchgear for underground or overhead networks with an operating voltage of 6-35kV

- Fault direction detection
- Transmits fault data to a SCADA systems
- Operates in compensated networks and networks with isolated and resistive grounding
- Detects all types of faults: PtP, PtG
- Standby power supply
- Equipped with LEDs and blinkers array for visual indication
- Event logging in embedded memory
- Sensors with optic fiber cable can be installed on bus bars without risk of breakdown to chassis
- Configurable relay outputs
# Technical characteristics

## IKZ-K4

<table>
<thead>
<tr>
<th>Model</th>
<th>IKZ-K4</th>
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<tbody>
<tr>
<td>Operating voltage</td>
<td>6kV– 35kV</td>
</tr>
<tr>
<td>Fault type detection: PtP PtG</td>
<td>Yes Yes</td>
</tr>
<tr>
<td>Fault type differentiation</td>
<td>Yes</td>
</tr>
<tr>
<td>Breaker waiting time (Δt)</td>
<td>0,1 – 30s</td>
</tr>
<tr>
<td>Trigger conditions: Absolute threshold</td>
<td>Yes</td>
</tr>
<tr>
<td>Differential threshold</td>
<td>Yes</td>
</tr>
<tr>
<td>Response time</td>
<td>0,02s</td>
</tr>
<tr>
<td>Current threshold range</td>
<td>10-1000A</td>
</tr>
<tr>
<td>Voltage threshold range</td>
<td>1-35kV</td>
</tr>
<tr>
<td>PtG current threshold range</td>
<td>0,4 – 200A</td>
</tr>
<tr>
<td>Power supply:</td>
<td></td>
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<tr>
<td>Auxiliary service supply</td>
<td>~220V</td>
</tr>
<tr>
<td>DC power supply</td>
<td>=24V</td>
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</table>
A-Signal Feeder Monitor

Universal solution for overhead lines and underground cable networks monitoring

△ Energy system automation;

△ Storage of the fault process parameters independently of external power supply presence;

△ Intelligent network monitoring;

△ Guaranteed improvements of SAIDI and SAIFI reliability indexes;

△ Observability of faulty sections in networks with various topology;

△ Phase to Ground fault registering algorithm with sensitivity from 0.5A;

△ Localization of all types of faults in overhead lines and underground cable networks;

Fault waveform recording with 256 points per cycle
A-Signal Feeder Monitor

Network parameters monitoring
- amperage
- wattage
- voltage
- industrial frequency
- flow direction
- minimum and maximum flow values

Indication of various types of faults
- phase to phase short circuits
- phase to ground short circuits
- cross country faults
- fault direction indication
- intermittent arcing ground short circuit identification
- faulty phase detection

Event logging
- nonvolatile memory
- large size of internal memory (up to 200 events)
- Timestamp
- fault type designation
- fault currents and fault voltages value storage
- fault process waveform recording
## Technical characteristics

### A-Signal

<table>
<thead>
<tr>
<th>Model</th>
<th>Lodestar CL0.5</th>
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<tbody>
<tr>
<td>Operating voltage</td>
<td>&lt;70kV</td>
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<tr>
<td>Frequency</td>
<td>50Gz</td>
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<tr>
<td>Min fault sensing PtG</td>
<td>0.5A, but min 4% of $I_{load}$</td>
</tr>
<tr>
<td>Absolute current threshold</td>
<td>20 – 1000A</td>
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<tr>
<td>Breaker waiting time ($\Delta t$)</td>
<td>0.5 – 200s</td>
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<tr>
<td>Inrush resistance</td>
<td>0-200s</td>
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<tr>
<td>Indication</td>
<td>LEDs</td>
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<tr>
<td>Fault type detection: PtP</td>
<td>Yes</td>
</tr>
<tr>
<td>Fault type detection: PtG</td>
<td>Yes</td>
</tr>
<tr>
<td>Fault direction detection</td>
<td>Yes</td>
</tr>
<tr>
<td>Communication</td>
<td>ComBox (optional)</td>
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<tr>
<td>Fault phase indication</td>
<td>Yes</td>
</tr>
<tr>
<td>Current withstand</td>
<td>25kA/500ms</td>
</tr>
<tr>
<td>Radio</td>
<td>433.92 Gz</td>
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<tr>
<td>Remote (optional)</td>
<td>Yes</td>
</tr>
<tr>
<td>Reset</td>
<td>Time, Magnet, Line restoration, Com</td>
</tr>
<tr>
<td>Adjustable reset time</td>
<td>1h to 7 days (1h to 99hours via Remote)</td>
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<tr>
<td>Battery life</td>
<td>7 years</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40°C to +85°C</td>
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Versatile communications
Fault Indicators

Our developments provide various types of communications:

- Data transmission from FIs to the system of power distribution network diagnostics Komorsan
- Data transmission from FIs to a SCADA system via data collecting and processing server Komorsan
- Direct data transmission from FIs to SCADA system
- Direct data transmission from FIs to various telecontrol and information systems

For data transmission security data encryption algorithms are intended
A3 provides an intelligent approach for overhead and underground networks monitoring as a user-friendly, WEB-based plug and play solution.

An integrated system of power distribution network diagnostics - "KOMORSAN" is designed for immediate short circuit identification and fault data transmission to dispatching point and targeted customers.

When fault occurs the System sounds audible alarm, displays the place of a fault on a map and notifies maintenance crew via SMS and E-mail reducing time for fault localization.

Configuration and control of diagnostic devices are done remotely.
The Komorsan system consists of:

- Data collecting and processing server;
- Database;
- Komorsan Web-client software;
The measuring part of the System includes short-circuit indicators for OHL and underground networks, Icing sensors, feeder monitoring devices that provide measurements of electrical network main parameters and processes occurring in it.

**Communication units** perform communication between the measuring and control parts of the System.

**Data processing server** collects data from Sensors via industrial protocols ModBus and IEC 60870–5-104.

**Data exchange** with external systems/SCADA integration is performed via IEC 60870–5-104.
KOMORSAN System overview

The KOMORSAN Web-client software provides:

- **Secure data access.** Log-in the System is available using account.
- **Complete control of user roles and permission levels.** The System administrator can create and manage users roles, permission levels and available features.
- **No limits for quantity of simultaneously logged users.**
- **Event mapping on any type of network topology.** Mimic diagrams displays on terrain map with devices installed.
- **Analysis and Diagnostics.** Wide set of analytical tools. Data can be combined and processed regarding to a device, event or an object. You choose which parameters to view and the order in which you view them. All data are presented in graphical or tabular formats.
- **Data export.** All necessary information can be exported in PDF, HTML or CSV formats.
- **Waveform recording.** Recorded waveforms can be viewed and exported in comtrade format.
- **System life cycle support.** Release updates + technical support.
THE KOMORSAN SYSTEM KEY BENEFITS:

- Configure and control monitoring devices
- Access data remotely via any portable device
- Easy to implement and easy to manage
- Fast device setup
- Simple configuration
- Less maintenance work
- Lower IT resources costs
- Cost-effective
- Immediate and reliable fault localization
- Notifying service crews via email and SMS messaging
- Web browser-based user-friendly interface
- Smart analysis and diagnostic tools
- Integration to SCADA
- Remote firmware upgrades
- Cross-platform
- Guaranteed technical product support 24/7
- Secure access
- Data export
- Network topology mapping
# KOMORSAN technical characteristics

<table>
<thead>
<tr>
<th>System requirements</th>
<th></th>
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<tbody>
<tr>
<td>Supported platforms</td>
<td>Linux</td>
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<tr>
<td>Database</td>
<td>PostgreSQL</td>
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<tr>
<td>Processor</td>
<td>Xeon 4C E3-1241v3 (or any similar)x1</td>
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<tr>
<td>Processor type</td>
<td>3.5GHz/1600MHz/8Mb</td>
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<tr>
<td>RAM</td>
<td>8Gb DDR3</td>
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<tr>
<td>HDD</td>
<td>SAS/SATA, 7.2K 6Gbps NL, 2x 500Gb</td>
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<tr>
<td>Dual Ethernet</td>
<td>Yes</td>
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</table>

<table>
<thead>
<tr>
<th>Management</th>
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<tbody>
<tr>
<td>User access management</td>
<td>Yes</td>
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<tr>
<td>Fault notification</td>
<td>Alarm, SMS, E-mail</td>
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<tr>
<td>Continuous storage of all information</td>
<td>Retrospective</td>
</tr>
<tr>
<td>FI threshold and settings</td>
<td>Remotely adjustable</td>
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<tr>
<td>Data export</td>
<td>Yes</td>
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</table>

<table>
<thead>
<tr>
<th>Communications</th>
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</thead>
<tbody>
<tr>
<td>Data exchange with external systems</td>
<td>IEC 60870-5-104 protocol</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Devices</th>
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<tbody>
<tr>
<td>OHL FI</td>
<td>Lodestar CL25B/CL2B/CL0.5B, Lodestar CL2/CL0.5, IKZ-V2</td>
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<tr>
<td>Cable FI</td>
<td>IKZ-K</td>
</tr>
<tr>
<td>Feeder monitor</td>
<td>A-Signal</td>
</tr>
<tr>
<td>Icing sensors</td>
<td>DO</td>
</tr>
<tr>
<td>ComBox</td>
<td>LightBox, LightBox BLE, SmartBox</td>
</tr>
</tbody>
</table>
Thank you for your attention!

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