PSK-3.3k SECTIONOLIZING POINTS for railways

PSK-3.3k SECTIONALIZING POINT. FUNCTION

3.3 kV DC contact network sectionalizing point is designed for:

- 3.3 kV DC railway contact network sections electrical connection,
- protection against short-circuit currents and excessive overloads (contact network losses reduction, fast identification and disconnection of damaged section).

PSK-3.3k DESIGN

PSK-3.3k is a modular design unit.

PSK-3.3k module is a non-separable metal container with **IP53** protection degree according to DSTU IEC 60529:2019.

All metal parts of the module have **corrosion-resistant coating** - galvanic and paint. The floor is coated with aluminum corrugated sheet, resistant to abrasion.

The walls, floor and roof of the module are **insulated**. Thermal insulation is resistant to thermal stress, **fire-resistant**.

PSK-3.3k DESIGN

External power conductors are connected to **bushings** on the roof of PSK-3.3k.

External conductors are fixed to stretcher insulators on **anchoring device** mechanically to reduce load on the bushing.

PSK-3.3k DESIGN

There are also **air dischargers** and **surge arresters** for each feeder on the anchoring device.

PSK-3.3k DESIGN

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PSK-3.3k EQUIPMENT

PSK-3.3k EQUIPMENT

PSK-3.3k modules are equipped with:

- forced-air ventilation,
- air conditioning system,
- heating system,
- operating and emergency lighting systems.

Air conditioner

Temperature sensors

Air conditioner outdoor unit

PSK-3.3k EQUIPMENT

Ventilation system

Heating

PSK-3.3k EQUIPMENT

Lighting system

Diode, energy-saving lamps are used in lighting systems.

INTRUSION PROTECTION

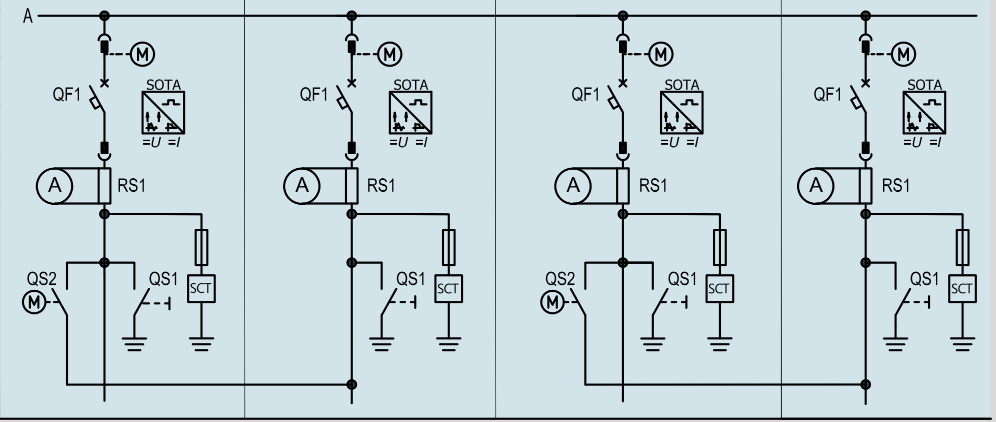
Reliable **lock with five deadbolts** is used to ensure protection against intrusion into the module.

The **door handle** design makes it difficult to open the door by vandal methods.

Anti-cuts (anti-removable bolts) are used not to allow breaking the door by cutting off the door hinges.

Sound signal of the applied **external alarm** reaches **130 dB**, that is comparable with the sound power of jet aircraft engines operation.

PSK-3.3k SINGLE-LINE DIAGRAM

Cubicle designation		RU-3.3k-L	RU-3.3k-L	RU-3.3k-L	RU-3.3k-L
Cubicle number		A4	A2	A1	A3
Rated voltage	3.3 kV				
Busbars rated current	4000 A				
Rated current	4000 A				
Thermal resistance current	25 kA				
Primary connections diagram					

DC SWITCHGEARS 3.3 kV

Reliability and safety

- application of components with high switching capacity, high dynamic short-circuit current resistance and long mechanical life;
- safety guarantee due to electrical and mechanical interlocks, separating and protective structures;
- safety and reliability in accordance with the International Electrotechnical Commission (IEC) standards confirmed by type tests in IPH Institut (Berlin, Germany) test center and IEL (Warsaw, Poland), including tests on the internal arc localization.

DC SWITCHGEARS 3.3 kV

Serviceability

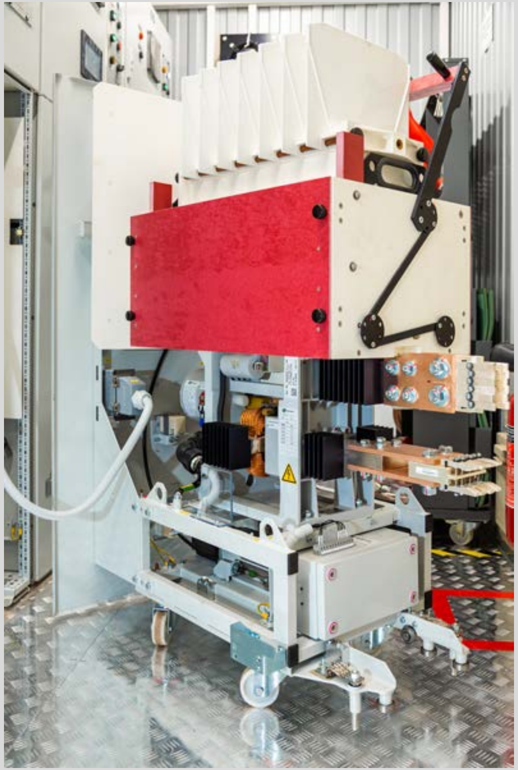
- don’t require frequent periodic maintenance and regular repairs;
- easy inspections due to withdrawable unit (trolley with circuit breaker);
- unilateral maintenance providing easy access to all cubicle components and saving space in the module.

DC SWITCHGEARS 3.3 kV

Protection, monitoring, diagnostics

- easy control of switching devices, trolley rolling in and out via touch screen;
- fast display of information on the switching elements and trolley status, current and voltage values, history of events, trends, settings;
- traction network protection against short-circuit currents and overloads;
- IEC 61850 protocol support.

DC SWITCHGEARS 3.3 kV



High-speed circuit breaker UR (Sécheron)

- high switching capacity;
- long lifetime;
- minimum tripping time;
- high mechanical resistance 8x25000 cycles;
- reduced overvoltage during tripping;
- stepless regulation of trip setting;
- automatic setting of contact tightness.

DC SWITCHGEARS 3.3 kV

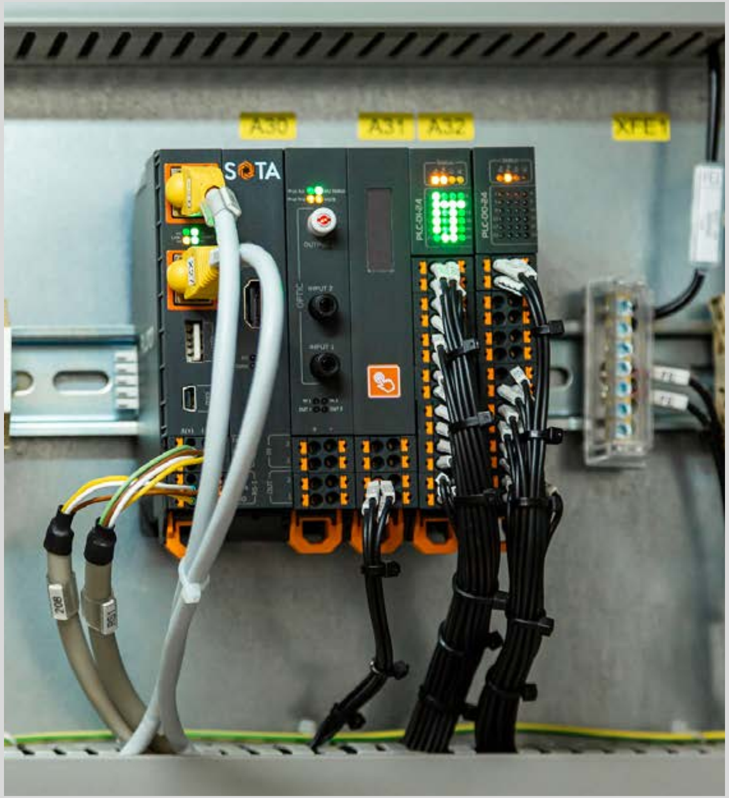
High-speed circuit breaker	Type	UR40-64S
	Rated current, A	4000
	Breaking capacity I_{Nss}/T_{Nc}, кA/ ms	50/31,5
	Setting range , kA	2,0-8,0
Main circuit disconnector	Type	RS-4K-U5
	Rated current , A	4000
Earthing switch	Type	EDS 125
Shunt type		B2,60 mV, 5000 A
Ammeter type		MA19N, 60 mV, 5-0-5 kA
Protection unit with control system		SOTA
Control circuits rated voltage , V		DC 220
Lighting circuits rated voltage , V		AC 230
Line tester		Yes
Maintenance		Unilateral
Motorized drive with lengthwise trolley movement (inside the cubicle)		Yes

CONTROL AND PROTECTION SYSTEM SOTA®

SOTA® system is a combined microprocessor-based relay protection device. This solution combines relay protection and PLC systems into a single modular system for performing a wide range of tasks.

Modular architecture of SOTA® system, combined with modern surface mount technology, ensures high reliability, high processing power, and fast response.

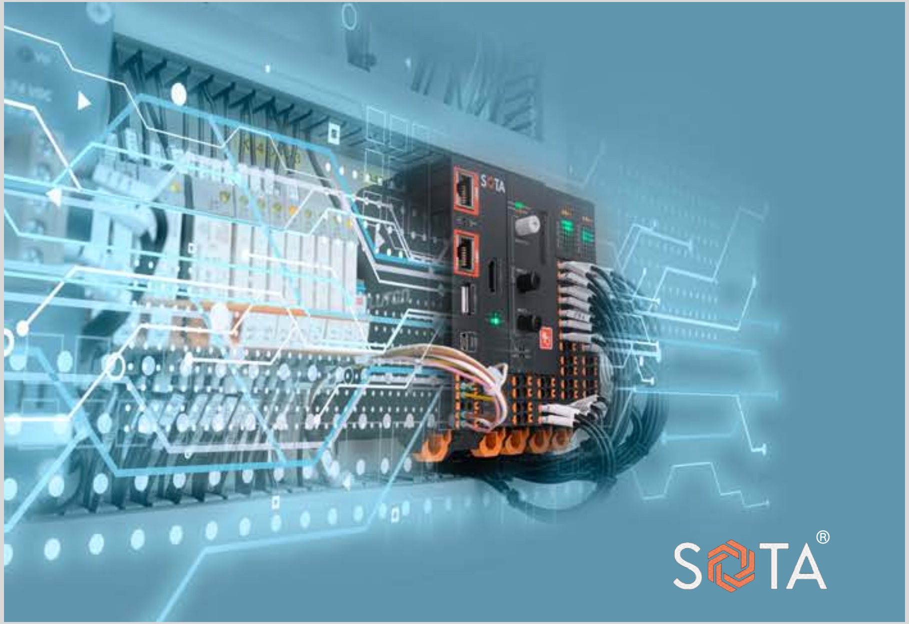
SOTA® provides high precision measurement of electrical values and time intervals to improve performance of processing operations and response of protection functions.



SOTA® FUNCTIONS

- Traction network parameters monitoring
- Emergency processes waveforms recording
- Data collection for further analysis
- Traction network protection against short-circuit current and overloads
- Events logging
- System remote control
- Cubicle operation control (PLC)
- Daily trends storage
- Communications protocols support

IEC 61850 IMPLEMENTATION ADVANTAGES



IEC 61850 is a universally applicable international standard that allows to arrange unrelated solutions produced by different manufacturers of relay protection equipment and data transfer systems that are applied at the substations.

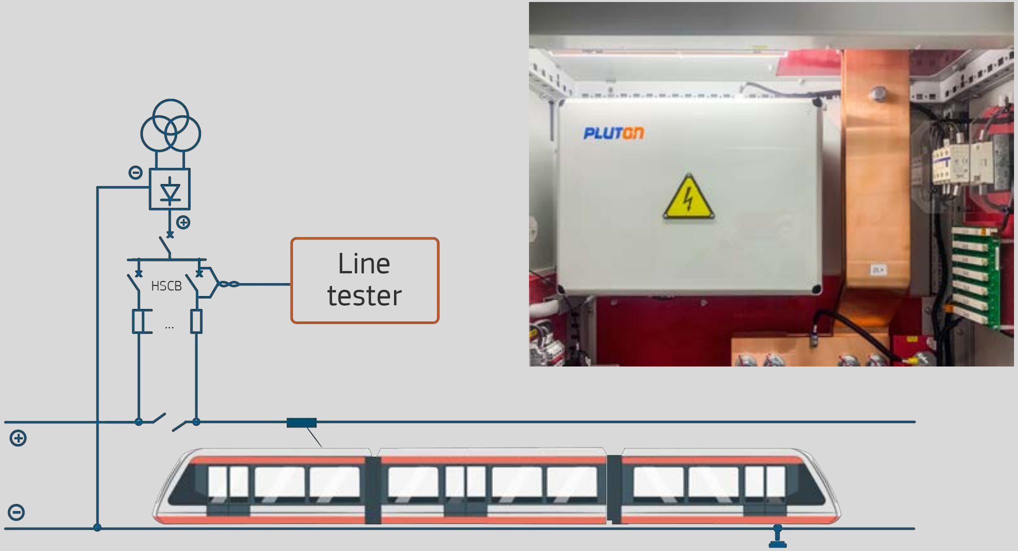
IEC 61850 provides:

- signal transfer reliability increase;
- compatibility and interchangeability of equipment in case of substation expansion (modernization);
- application of IEC 61850 standard opens up opportunities for future transition from traditional to digital substation, i.e. to a qualitatively new level of power facilities automation and control.

LINE TESTER

Line tester is applied in each cubicle. After each tripping of high-speed circuit breaker the line tester does not allow it to close until it has checked the line for a short circuit in the line.

This significantly improves performance of the cubicle, prevents the high-speed circuit breaker from closing on short circuits and thus protects it from overcurrent and arcing impact.



AUXILIARIES CABINET SHSN

Auxiliaries cabinet SHSN function:

- ventilation and air conditioning, lighting and heating systems operation control;
- fire and security alarm systems power supply.

AUXILIARIES CABINET SHSN

SOTA® controller with 7" visualization panel is installed in the auxiliary cabinet. It displays general mnemonic diagram of the sectionalizing point.

This allows operating personnel to see the whole operating circuit of the substation with all the cubicles and disconnectors from one place and to control them.

AUXILIARIES CABINET SHSN

Isolation transformer is applied at the input of auxiliary supply network to prevent ingress of DC current from the circuit breaker power supply circuits and 3.3 kV DC into 230 V AC network.

External low-voltage cables are connected from the bottom of the module foundation with **cable glands** to ensure proper degree of protection against external impacts.

SERVICE PERSONNEL WORKPLACE

In designing the arrangement of equipment inside the sectionalizing point, maximum attention was paid to ergonomics of the main and auxiliary equipment.

Service personnel **workplace** is organized using hanging cabinet for documentation, a desktop and a chair, hooks for outerwear.

Climate and ventilation systems are installed in a way to avoid causing discomfort to personnel during work.

SERVICE PERSONNEL WORKPLACE

RACK FOR PPE AND TOOLS

A new **rack for PPE (Personal Protective Equipment) and tools** for small spaces was developed with smart ergonomics of equipment stacking areas.

WORKPLACE RATIONALIZATION SYSTEM - 5S

5S workplace rationalization system is applied in the module. Each PSK-3.3k auxiliary item and device has its own specific place.

WORKPLACE RATIONALIZATION SYSTEM - 5S

Each item (circuit breakers setting checker, dielectric ladder, PPE rack, service personnel workplace, etc.) has an info plate and a mark at the designated place.

QUALITY CONTROL

All stages of module production are **checked by the company quality department.**

Welds and the geometry of the module's supporting parts are checked at the initial stage.

The last stage is compliance of paint coating quality indicators and check of all the necessary items for connections and networks laying.

Thank you for attention!

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