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ELECTRIC SWITCHES HEATING SYSTEM

Elektrizace železnic
Praha a. s.



Electric switches heating system

The EOV EŽ Electric switches heating System

The EOV EŽ electric heating system is designed to prevent the freezing of the moving parts of switches under unfavourable climatic conditions in winter. The heating is provided by rod heaters, which transfer supplied electricity into heat with help of a spiral-shaped resistance wire placed in an insulated body. The rod heaters are fixed:

- to the inner side of the stock rail foot, next to the slide baseplates which support moving switch blades and to the frogs with sliding nose,
- upon an adapted support steel sheet placed at the bottom of the space between sleepers under the switch locks
- upon adapted bearing structure installed in hollow sleeper.

The heat emitted from the rod heaters (by way of heat conduction or radiation) causes the melting of snow and ice formation between the fixed and the moving parts of the switches.

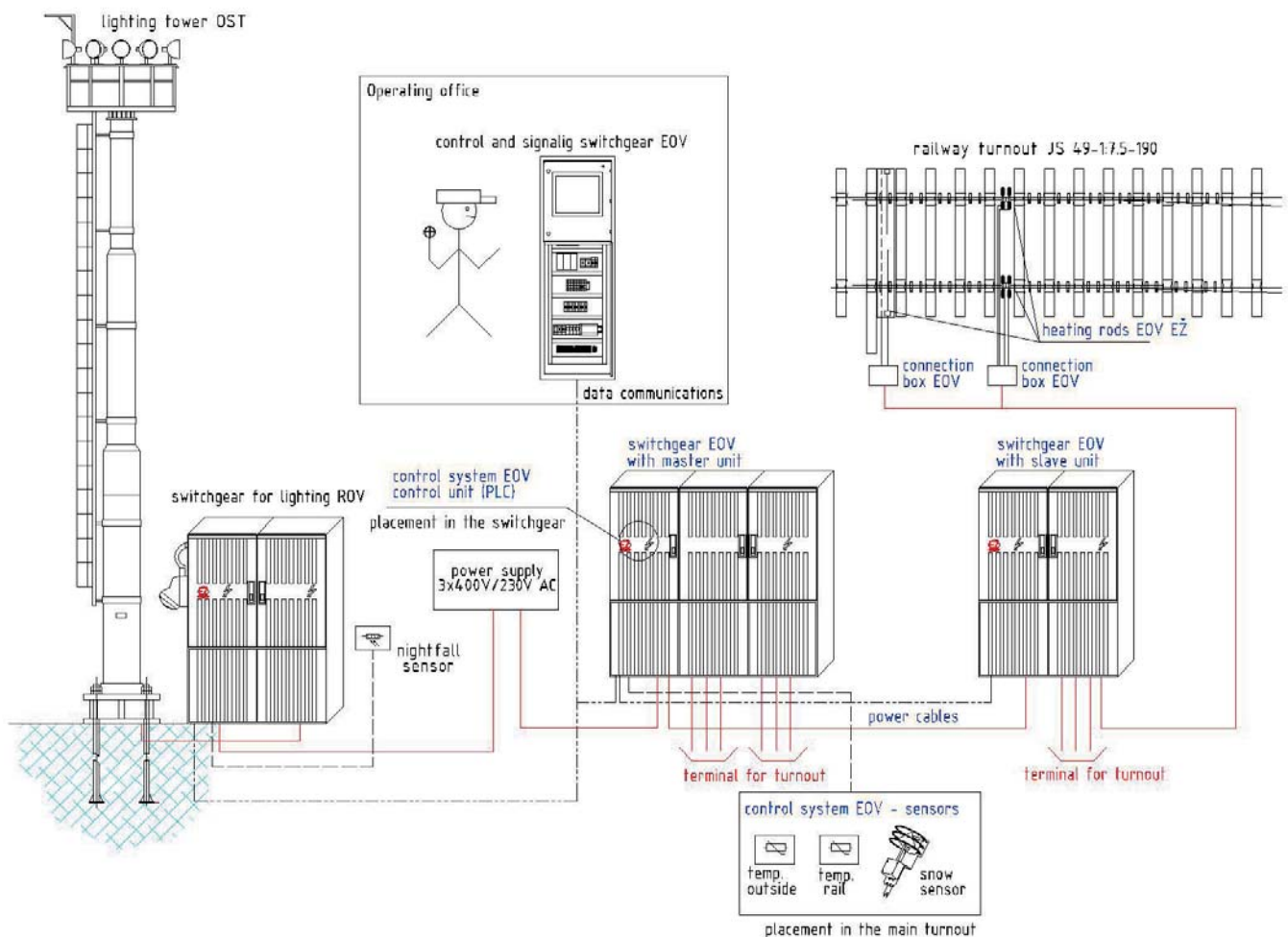
The EOV EŽ heaters are powered by electricity. There are the following power supply options:

- Electricity supplied from the 25 kV/50 Hz overhead contact line via a transformer station (walled, pre-fabricated, box or pole-mounted);
- Electricity supplied from the 3 kV/DC overhead contact line via a converter station (walled, pre-fabricated, box or pole-mounted);
- Electricity supplied from the 3x400 V/230 V/50 Hz distribution grid.

The EOV EŽ equipment consists of the following components:

- Regulation system;
- Rod heaters and cables;
- Connecting boxes;
- Low-voltage distribution switchboards;
- Controlling and signaling switchboard;
- Control unit.

The block diagram showing the EOV EŽ electric switches heating system (one of available versions).



Regulation system

The regulation system consists of a precipitation sensor, an outside temperature sensor, a rail temperature sensor, and a PLC control unit. The regulation system provides for automatic control of the EOV EŽ unit depending on the climatic conditions.

The precipitation sensor and the outside temperature sensor indicate rain, snow, and snow drifted to the switches by wind or by a passing train. The precipitation sensor and the outside temperature sensor are to be installed so that the readings show the climatic conditions in the area of the heated switches.

The rail temperature sensor is placed on the reference switch so that ideal transfer of heat to the sensor is ensured, and any cooling effect outside its contact to the rail is eliminated. The regulation unit may be placed inside the low-voltage distribution switchboard or in a separate box.

Rod heaters and their power supply

The EOV EŽ electric switch heating system includes rod heaters manufactured by TRIATHERM Sonneberg GmbH. The rod heaters are made of flat oval chrome-nickel stainless steel. The heating spiral is embedded in magnesium-oxide insulating material. They are supplied complete with vulcanized cables 4 or 6 meters long. The number and the power of the rod heaters depend on the type of the switch and the local climatic conditions. The power supply for the rod heaters comes from a low-voltage distribution switchboard via cables connecting the individual switches by way of connecting boxes placed near to the switches. The individual rod heaters are connected to those connecting boxes via cables.

Connecting boxes

The connecting boxes are made of plastics, resistant against mechanical damage. The connecting boxes comply with the requirements for Class II protection and IP 65 enclosure.

Low-voltage distribution switchboards

The low-voltage distribution switchboard complies with the requirements for Class II protection and IP 44/20 enclosure. The low-voltage distribution switchboard is placed within the track system upon a separate base or in a separate building, such as a transformer station. Power supply input is protected with help of a fuse switch, also serving as the master switch. The switchboard incorporates an electricity consumption meter. There are two heating circuit outlets for each of the switch: one of them serves the heating of the stock rails while the other provides for the heating of the switch locks. Each of the outlets is fitted with a current relay, a circuit breaker, a contactor and according to a norm ČSN EN 50122-1 ed.2 (Protective provisions for low voltage non traction power supplies) outlet is fitted with residual-current device or isolation transformer.

As regards their control, the EOV EŽ low-voltage distribution switchboards are divided as follows:

- 1) „Low-voltage distribution switchboard with a subordinated unit” – they control the switching of the outlets attached to rod heaters with help of their own sensors, and – at the same time – they control outlets attached to another low-voltage distribution switchboard.
- 2) „Subordinated low-voltage distribution switchboard” – the rod heater outlets are controlled by another low-voltage distribution switchboard.
- 3) „Low-voltage distribution switchboard without a subordinated unit” – they control switching of the outlets attached to rod heaters with help of own sensors.

Controlling and signaling low-voltage switchboard

The controlling and signaling low-voltage switchboard allows communication with the superior control system, the EOV EŽ low voltage distribution switchboards, as well as with other peripheral equipment, such as lighting low-voltage switchboards. Its touch panel facilitates controlling, testing and checking of the individual subordinated low voltage switchboards.

The controlling and signaling low-voltage switchboard is located in the traffic control room.

Control units

The EOV EŽ low-voltage distribution switchboards may be controlled automatically or manually. Under automatic control, the regulation system would check outside conditions as reported by the sensors and subsequently control power supply to the rod heaters. Manual control is performed with help of push-buttons located in the switchboard or by way of a local controlling system or from the dispatch center.

The local controlling system is situated within the controlling and signaling switchboard and it makes use of the Geovap Reliance 3 software. This software allows for recording defects and reports and evaluation of any values recorded in well-arranged charts. This visualization tool produces charts showing in a graphical form the immediate state of the individual controlled elements (heated switches) including any reports of defects and the current state of the equipment. Everything is duly stored for the purposes of subsequent tracking.

Conclusion

EOV EŽ makes use of the most modern controlling unit and regulation system, which ensure high economy of operation while being in compliance with the demanding requirements of operability of switches throughout the winter season. Significant energy savings have been achieved by an innovation applied as regards the fixation of the rod heaters under the “nose” of the stock rail. A touch screen offers high comfort in the operation of the EOV EŽ system as well as certain other equipment, such as railway station lighting.



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