

TRANSFORMERS USED IN RAILWAY ENGINEERING

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Supplying the track electric circuits is carried out for the purpose of operational safety, usually by means of isolating transformers, the parameters and structure of which are adjusted to changeable and difficult working conditions.

For the more than ten years ELHAND TRANSFORMATORY has been manufacturing railway transformers of the types ET1KOL and ET3KOL, adjusted to operate in track supply systems.

Transformers supplying electric heating systems for railway crossovers

The transformers supplying the systems for heating railway crossovers (EOR) are untypical isolating transformers, adjusted for operation in the environment with very high humidity and considerable annual and daily temperature amplitudes. They usually operate in the sets of a few transformers, isolating the circuits of electric heaters for heating railway crossovers. These are usually non-service systems, placed in wells or boxes on the verges of track line.

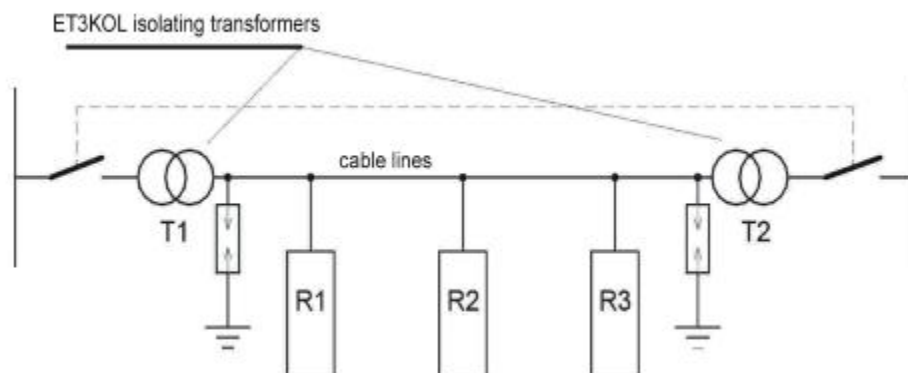
The single-phase isolating transformers for the railway crossover electric heating devices are manufactured in two types: ET1KOL and ET1KOLŻ, as well as in two power values: 1.8kVA and 2.5kVA. These powers result from the demand and typical solutions (EOR) used in Polish railway engineering. The voltage transmission gear, typical for the isolating transformers – 220/220V or 230/230V; the temperature class for these transformers is T10E.

The ET1KOL and ET1KOLŻ do not operate in closed spaces but in special track boxes. Thus, the ambient temperature range between -40°C and $+10^{\circ}\text{C}$ is assumed. However, the increase of the ambient temperature requires decreasing the load or limiting the time of full load. The structure of these transformers enables stability of technical parameters in the scope of ambient temperatures from -40°C to $+70^{\circ}\text{C}$. 20% durable current load is possible without any harm to the machine insulation.



Drawing 1 ET1KOLŻ isolating transformers for supplying crossovers electric heating systems (EOR)

Electric insulation has been strengthened – the ET1KOL and ET1KOLŻ have the second protection class. They have been adjusted to fit typical ECG-102 boxes at IP44 protection level. The transformers cores are traditionally manufactured from anisotropic silicon sheets of a thickness from 0.25 to 0.5mm. The ET1KOL transformer is vacuously impregnated and the ET1KOLŻ is additionally coated with resin, which makes it water-resistant and entirely resistant to any water that may appear in the box in which it is installed. The resin that covers the core in 100% and the ET1KOLŻ transformer windings also protects against possible attempts at recovering copper from the transformer, which is impossible without the application of special tools and technologies. Additional equipment of the ET1KOL and ET1KOLŻ transformers comprises thermistor mufflers of the NTC20H2R5M type that limit the transformer making current. The mufflers are installed optionally, since the railway transformers manufactured by ELHAND TRANSFORMATORY have rather small current making, limited at the design stage, as opposed to toroidal transformers, for example. The transformers may be protected against short circuits with excess current switches S301 with the C type characteristics and 20A current.



Drawing 2 Diagram fragment for the supply system of automatic line blockades used in railway engineering

Transformers supplying automatic line blockade devices

These transformers supply the devices controlling railway traffic.

The automatic line blockades are used by the Polish Railways (PKP) on the lines with high traffic intensity by installing this type of device for controlling railway traffic and thus the increase in track flow capacity is achieved. What is more, due to its structure, they ensure the safety of the railway traffic to a much greater extent than the line devices used in railway engineering in the past.

However, the condition for all this is the provision of failure free supply. For this purpose, the industrial control system circuits are used to form the entire set together with supply transformers.

The supply is executed by the isolating transformers of ET3KOL type. The transformers are installed at both ends of the supply line. This guarantees the reserve for the blockade supply should one of them fail to operate. It is the control systems that steer the respective sequence for combining the transformers. The three-phase isolating transformers in the ET3KOL railway version are adjusted to operation in any climate zone. This is possible due to the special casing and highly effective vacuous impregnation. Due to overvoltage limiters in combination with strengthened insulation, the transformers are resistant to switching overvoltages and lightning surges. Large overvoltage resistance from the supply side during atmospheric discharges has been confirmed by the rare occurrence of damage to the track electronics used in the impact elements

track-vehicle of the SOT non-connection track circuits and pertaining to transmitters. In this regard, owing to rare failure frequency of the SOT circuits, high exploitation results are achieved.

This is possible because of the application of the a/m transformers without taking into account the operational cost reduction (the repair cost of one transmitter is about 100 €).



Drawing 3 ET3KOL isolating transformer for supplying blockade lines

The ET1KOL, ET1KOLŽ and ET3KOL isolating transformers are manufactured in accordance with the PN-IEC 61558 norm. Moreover, the production process is executed on the basis of the procedure for quality assurance system as per the ISO 9002 norm, guaranteeing the repeatability of technical parameters and the highest quality of the machines manufactured.

Bibliography

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