

TRANSFORMERS IN THE SYSTEMS SUPPLYING MEDICAL LOCATIONS

Stefan Skorupski², Mirosław Łukiewski¹

¹ ELHAND TRANSFORMATORY,

e-mail : m.lukiewski@elhand.com.pl

² HORUS ENERGIA,

e-mail : poczta@horus-energia.com.pl

A considerable proportion of electronic instrumentation used in contemporary medicine requires the design and implementation of reliable supply systems. The continuity and stability of the supply for medical instrumentation is necessary for the patients' health and sometimes even their lives.

The ELHAND TRANSFORMATORY Company from Lubliniec is a Polish manufacturer of ET1MED transformers dedicated to the supply of devices in medical locations.

IT system medical networks

The application of IT network systems is associated with the transformer protection against the excessive increase in the windings temperature and overloads, which is required by relevant norms. Moreover, the entire network must be equipped with devices for constant insulation control. [6,7].

The supply reliability is obtained thanks to the IT application and is completed with a relevant supply system from the common network and from ones own, independent power sources, installed at the unit (e.g. current-making resources). The latter, at the current technology development stage, are capable of supplying reserve power for medical instrumentation used in medical locations (operating theatres, anaesthetic, gypsum, delivery, angiography, dialysis rooms, etc.) within the time of 15 seconds as stipulated by the norm [7].

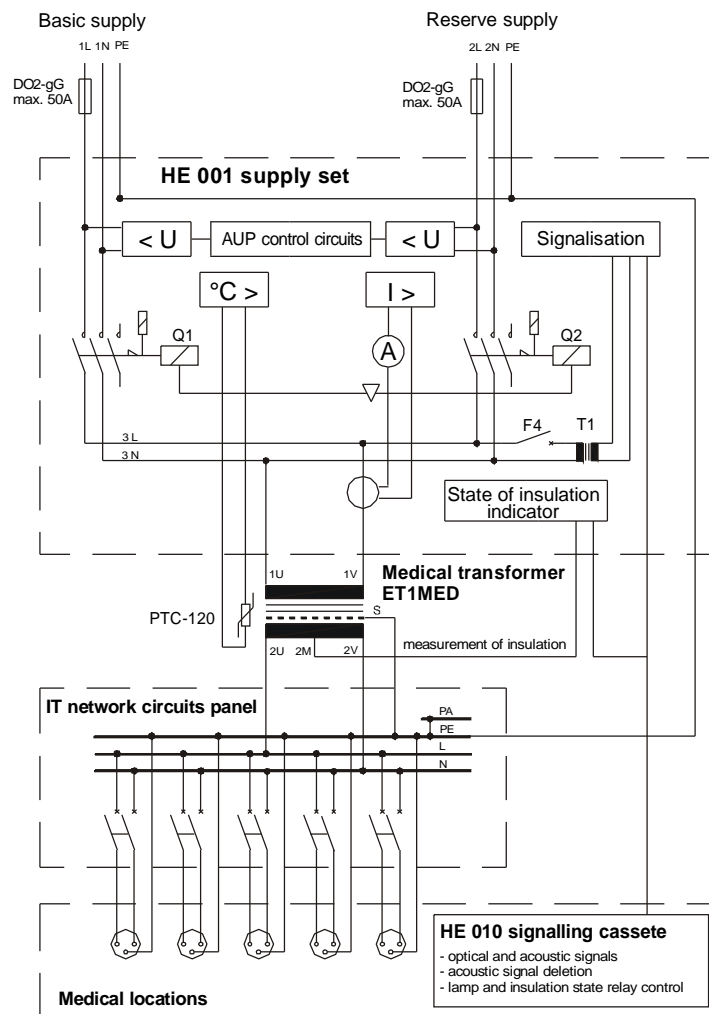
So as to meet the requirements for the supply of IT network from two independent sources by means of automatic switching systems and taking into account individual customers needs, the ELHAND TRANSFORMATORY Company, together with HORUS ENERGIA Company, implement complex deliveries of isolating transformers with automatic sets meeting the requirements stipulated in the norm [5], comprising: switching system, transmitters for monitoring the system, devices for basic and reserve voltage value control, (within the allowances required by the norm [7], execution elements (contactors with latch mechanism, blocked mechanically and electrically), as well as time transmitters enabling the following:

- § feeding the reserve supply with a delay, necessary to avoid redundant switchovers at momentary voltage fluctuations and enabling sequential switches of the transformers in order to avoid excess currents in the network supplying many IT systems,
- § regulation of voltage-free interval time, necessary when switching unsynchronised supply sources,
- § regulation of the time needed for the system to return to basic supply (this delay is necessary in order to avoid numerous switchovers at the moment of return of the basic supply, e.g. when the common network control system works. Longer delays are quite often used by the time the current-making set reaches the determined working temperature, while testing the entire reserve supply system)
- § hand-operated control of the contactors with the maintenance of mechanical blockade.

ET1MED-type transformers

The ET1MED transformers are assigned to supply the devices in medical locations. The supply decay or electrocution in these locations poses a threat to patients' health and lives, even in the case of relatively low current. That is why the transformers must follow strict European norms [2,3]. No-load current of these types of transformers is lower than $3\%I_n$ and the short circuit voltage ranges within the limits of $3\%U_n$, whereas the switching current does not exceed the value of $12I_n$. The ET1MED transformers are isolating transformers with the transmission gear of either 230/230V or 220/220 V, depending on the manufacturing version. The operation frequency is 50Hz or 60 Hz and the power of the machines manufactured ranges between 2.5 and 8 kVA, as per the respective norm.

Since the transformers operate in the IT networks system, the isolating transformer leakage current is an important parameter. The norm [2] requires that the leakage current between the primary and secondary circuits and the primary circuit and the housing does not exceed the value of 3.5 mA. The ET1MED isolating transformers leakage currents fit within the limits of 0.5 mA



Drawing 1 Block diagram for the set for supplying medical locations

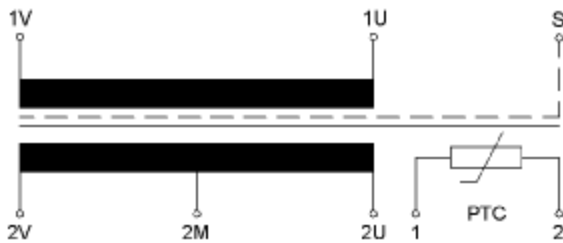
ELHAND TRANSFORMATORY

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The transformers for supplying medical locations have a structure that is typical for isolating transformers. The core of such a transformer is manufactured from low-coil electromagnetic sheet, usually cut in U shape.

The primary and secondary windings are coiled with a round or rolled formed copper wire, depending on the transformer power. On the secondary side, there is a middle branch 2M that is used for connecting the insulation state of the control transmitter. Inside the windings of each transformer of ET1MED type, there is the PTC-120 scanner enabling temperature control of the transformer windings. Between primary and secondary winding, there is a screen made of copper band and connected with S insulated terminal.

The ET1MED transformers are manufactured in II protection class (double insulation of active parts) and E temperature class (max. temp. 120°C). standard protection degree for the transformers without a casing, assigned for installation in boards is IP00. These transformers may also be delivered in casings with various protection degrees IPXX and to be applied in locations, where a transformer must be protected against the accidental touch of a live part.



Drawing 2 ET1 MED isolating transformer diagram

The transformers are equipped with current terminals enabling the connection of conductors and cables with the cross-section of 10 mm². In standard manufacturing versions the transformers are adjusted to operate in a vertical position and are fastened by means of angles.

The ET1MED transformers are vacuously impregnated in order to protect them against environmental impact. Next, they undergo a series of tests at the electric testing station, during which any possible product defects can be discovered.

On the basis of the tests carried out, the certificate of compliance with the IEC 61558-2-15:1999 is issued for the transformer tested, as well as a guarantee card. This is the transformer technical documentation. Upon the customer's request, the protocol with the electric measurements results can also be enclosed.

The activities connected with the manufacturing and preparation of the production process in the ELHAND TRANSFORMATORY Company are carried out in accordance with the procedures and instructions for the quality assurance system ISO 9002. This guarantees the highest quality and reliability, as well as repeatability of the technical parameters of the machines produced.

Bibliography

- [1] *ET1MED transformers technical documentation* ELHAND TRANSFORMATORY
- [2] *Norm IEC 61558-1-15:1999.*
- [3] *Norm DIN VDE 0107:1994-10.*
- [4] *Norm NFPA 99, 1999r. Health Care Facilities*
- [5] *Norm PN-EN 60947-6-1. Automatyczne układy przełączające.*
- [6] *Norm IEC 61557-8. Insulation monitoring devices for IT systems.*
- [7] *Projekt normy IEC 60364-7-710. (dokument 64/1175/CDV, 09-03-2001)*