

QUALICAST

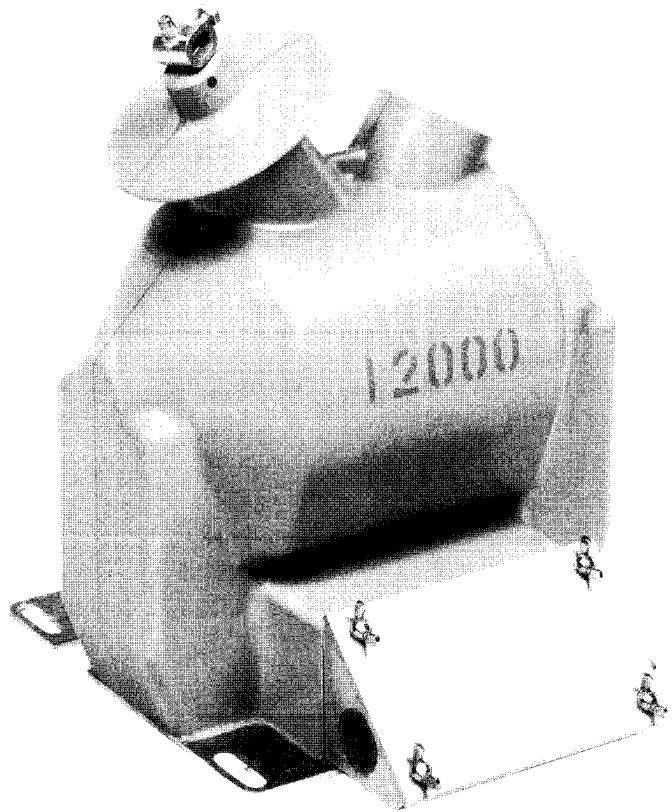
Line of Medium Voltage Instrument Transformers

History

Some 50 years ago aromatic epoxy resins were introduced and found their way into many applications in electrical apparatus due to their good electrical (insulation) properties and their excellent processing/manipulating properties. First tests to use these resins for outdoor applications were unsuccessful, due to tracking and subsequent failure caused by combinations of contamination, humidity, ultraviolet rays and electrical stress.

The introduction of cycloaliphatic epoxy resins at the beginning of the 1960's made insulation systems with good leakage current and arc resistance possible, even though initial problems with the mechanical properties had to be overcome. These first resins were very brittle and the adders used at the time to render the resin more flexible had an adverse effect on its outdoor properties.

Ritz has worked, since the beginning of these developments, with the resin manufacturers (e.g. CIBA Geigi, Bakelite) to solve these problems and to extend the quality and life expectancy of outdoor epoxy insulated instrument transformers. For that purpose, long-term studies on transformers have been performed for over 30 years in several installations. For example, one installation is located on the North Sea under maritime conditions and another



installation is in the heavily industrialized Ruhr Area in the western part of Germany. Based on these experiences and due to the requirements of Ritz designs, the resin and filler materials have been continually improved to enable us to offer today the QualiCast Line of Instrument Transformers from 5kV to 72.5kV voltage class.

Cycloaliphatic Epoxy Resin

Cycloaliphatic epoxy resins are produced by either peroxidation of cyclic olephins or by condensation of an acid such as hexahydrophthalic acid with epichlorhydrin followed by dehydrohologenation. The epoxy groups are on a ring structure and the crosslinkage in the networked polymer is higher than on standard epoxy resins. A silica flour filler is added to the resin to lower thermal expansion, reduce shrinkage during curing and increase thermal conductivity, as well as lowering the manufacturing cost. It is very important that the proper filler material be chosen, since it impacts the tracking resistance of the final product. A high-performance filler is used in epoxy resins used by Ritz, to enhance the bond between resin and filler particles. The main advantages of the filled cycloaliphatic resin, due to its chemical properties, are:

- **OUTSTANDING ELECTRICAL PROPERTIES**
- **EXCELLENT OUTDOOR WEATHERABILITY AND UV RESISTANCE**
- **HIGH TRACKING AND ARC RESISTANCE**
- **SELF-EXTINGUISHING CHARACTERISTICS**
- **VIRTUALLY INFLAMMABLE**
- **HIGH-MECHANICAL STRENGTH**
- **HIGH-THERMAL STABILITY**
- **LOW MAINTENANCE**

Design

Instrument transformers manufactured by Ritz are generally designed to meet customer requirements in every respect as defined in the applicable standards and specifications. Computer programs are used to calculate the magnetic circuit to meet the required accuracies. The other aspect of a medium voltage resin encapsulated instrument transformer is the insulation system. Cycloaliphatic epoxy resin with a high-performance filler is used as insulation material. However, not only the choice of a high-quality insulation material is important to ensure the good performance and long service life of an instrument transformer.

Another aspect is the design and shape of the active part (core and coil), of the conductors, armatures and fittings and, most importantly, electrodes to control the electrical stress on the unit. These design characteristics are very significant to avoid corona and concentration of leakage currents on the surface and inside the unit, which could cause damage to the insulation and could ultimately lead to failure of the unit. Ritz uses FEM programs (finite element method) to optimize the field stresses on and in the instrument transformers.

Additionally, the mechanical properties of the materials used, such as shrinkage, thermal expansion and contraction and chemical interactions need to be considered to avoid mechanical tensions or voids, which could cause cracking or internal discharges and shorten the service life of a unit.

If all these aspects are taken into account, the following goals are achieved:

- **CORONA AND DISCHARGE-FREE OPERATION**
- **RELIABLE AND REPRODUCIBLE ELECTRICAL AND MECHANICAL PROPERTIES**
- **COMPACT DESIGN**
- **DESIGNS TO ANY SPECIAL REQUIREMENTS POSSIBLE**

Manufacturing

Two major processes are used to produce dry type instrument transformers, (a) vacuum molding and (b) automatic pressure gelation. Ritz uses the pressure gelation method. Here the reactive liquid resin is injected in an evacuated and heated mold, where it is allowed to polymerize or gel while constant pressure is applied on the material. These molds are mounted on closing machines, which allow an automatic opening and closing of the mold and hereby a very efficient way of assembling the active part into the mold. Once the resin has hardened, the transformer is removed from the mold and placed in a curing oven, where it runs through a computer con-

trolled thermo-cycle, giving the insulation material its final electrical and mechanical properties.

During and before the casting, it is very important to control all processes, such as drying and degassing of the resin components and filler, the formulation of the resin, the vacuum values in the mold, the pressure after injection, as well as gelation and curing times. To provide a high-quality and cost-effective product, many of these processes are automatic and computerized. Advantages of such a manufacturing approach are:

- **CONSISTENT QUALITY**
- **REPRODUCIBLE ELECTRICAL AND MECHANICAL PROPERTIES**
- **COST-EFFECTIVE PRODUCTION**
- **FAST LEAD-TIMES FROM ORDER TO SHIPMENT**

Quality Control and Testing

Instrument transformers manufactured by Ritz are designed, manufactured and tested to meet the requirements of the applicable standards and special customer specifications.

To ensure a high-quality product, every unit passes several inspection and test points before being shipped. The process starts with the inspection and testing (where applicable) of incoming materials, tests and inspections in the manufacturing process, process control of the different equipment, final accuracy and insulation tests and final QA release before packing the product for shipment. Every Ritz unit undergoes the required accuracy and insulation tests defined by the applicable standards. Additional tests are performed, if required, to the customer specifications. In addition, every unit is partial discharge tested per IEC requirements during the Power Frequency Withstand Test and the values are recorded regardless of whether that requirement exists in the applicable standard or customer specification. This is to ensure internal discharge

and corona-free operation in service for a long service life.

The quality assurance systems in place in all factories of the Ritz Group are ISO 9001 certified.

The use of these quality systems enables Ritz to:

- **SHIP FLAWLESS PRODUCT PER CUSTOMER REQUIREMENT**
- **ACHIEVE CONSISTENT QUALITY**
- **CORRECT DEVIATIONS BEFORE THEY BECOME PROBLEMS**
- **ACHIEVE CUSTOMER SATISFACTION**

Conclusion

The application of state-of-the-art technology from the design phase to manufacturing and testing and the use of state-of-the-art materials allows Ritz to provide customers with high-quality product – the

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The goal is to achieve the same customer satisfaction in delivery and quality, whether providing a standard product ex-stock or a product designed for a special application. To achieve this, Ritz continues to monitor and adjust to market requirements as well as technologies as they become available. This approach has allowed the Ritz Group to become the world's largest supplier of instrument transformers in this voltage range.

You may refer to individual product bulletins to order your transformers by catalog number or contact the factory or one of our representatives to have a transformer custom designed to your needs.