Title of TC
Winding wires

A Background
Technical Committee N° 55 was created in 1962 and has met regularly to develop and maintain standards for winding wires.

Scope: To prepare international standards for wires for electrical winding, irrespective of conductor material, shape, size, or type of covering, taking into account the needs in all fields of electrical engineering, and international standards for winding wire packaging.

Working Groups: WG1, WG2, JWG3

Participating (P) Members: AT, CN, EG, ES, FR, GB, DE, IN, IT, JP, RO, RU, US

Liaisons: TC 2, TC 14, TC 90, TC 91, TC 96, TC 108, TC 112, TC 113

B Business Environment
B.1 General
The winding wire industry is a mature industry, one that continually evolves to meet the demands of expanding applications of its products. Present standards reflect the consensus of the members for the technology and materials represented. Changes are based on new technology as they apply to methods of test and material for products and packaging, new product designs, or in addressing environmental and health considerations. Winding wires are used widely throughout a broad spectrum of electrotechnical industries mainly for creating electromagnetic fields and transforming electrical energy. The range of applications of winding wires extends from the use of extremely fine wires for electronics and telecommunications applications, to the use of large insulated and covered wires for large motor and power transformation industries. Demand and use of winding wires is slowly increasing as industrialized nations seek to recover from declining economies, and demand for electricity in developing nations grows.

B.2 Market demand
The Committee continually analyzes and incorporates in its standards, the trends and changes in market demand for all types of winding wires traded between countries.

One aspect of market demand concerns the production and standardization of special insulated conductors for safety applications with zero-defect insulation, such as the conductors provided with “basic insulation” instead of the usual “functional insulation” of enamelled wires. This particular type of insulated conductor can be produced as enamelled wire with special technology or as extruded wire.

The scope of this new product is applied in safety electrical equipment (transformers, motors), typically operating at 300 V, in conformance with the insulation properties requested for the safety equipment.

IEC TC 55 has completed developing specifications and test methods concerning zero-defect enamelled wires and is now addressing requirements concerning extruded wires known as triple insulated wires.
B.3 Trends in technology

The winding wire industry is a very mature one, because winding wires are commodities. This is because in the present day market, the industry is present and well developed virtually everywhere in the world.

Winding wires are not end products, but components used by customers as materials in electrical equipment for creating electromagnetic fields and transforming electrical energy.

In the coming years, the industry hopes to introduce new generation winding wires having nanotechnology-enabled dielectrics with increased functionality for high-stress electrical environments. IEC TC 55, in cooperation with IEC TC 113, will develop international specifications and test methods to facilitate large scale production of these winding wires.

B.4 Market trends

The sustainability of the market is difficult and closely linked with the fluctuations of general economic trends. Since the winding wire industry is strongly connected with the trends of end user markets (automotive, domestic appliances, electrical rotating machinery, transformers, other electrical equipment), the particular technical demands of the end users are very important on the market. One such trend is the continual growing demand for aluminium winding wires due to increases in the price of copper in the past several years. New specifications for rectangular aluminium wires are now in development to respond to this demand. As such, IEC TC 55 strives to maintain a cooperative relationship with main end user representatives on the Committee and with other relevant IEC TC's, in order to open new scenarios in the future of the industry, to:

1) Maintain an awareness of new trends in relevant technology to the winding wires industry; and
2) Support the use of environmentally sound materials and processes in the production and use of winding wires. Examples of this support through standardization include*

a) Standardization of special alloys (for soldering the enamelled wires) not containing lead or other potentially hazardous metals;
b) Removal of the use of lead and other hazardous metals from the applicable IEC test procedures; and
c) Recognition of environmentally friendly refrigerants in the IEC 60851-4 Resistance to refrigerants test procedure.

Ongoing participation in the work of the Technical Committee and its Working Groups by producers, suppliers and users is highly encouraged. Increased activity toward environmental protection could pose significant difficulties on the winding wire market, particularly in Europe, due to stricter regulations concerning NMP (N-Methylpyrolidone) and other solvents and components of insulating varnishes, because these are not replaceable based on existing electrical and electronic equipment production practices. TC 55 actions to take place:

1) Support test methods respecting environmental protection and human health.
2) Collaborate with the electric and electronic equipment industry, in order to promote the use of winding wire that is produced using varnishes not containing NMP or other environmentally hazardous solvents.
3) Collaborate with the chemical industry in order to find alternative solvents and components not containing NMP or other environmentally hazardous solvents.
4) Discuss with the appropriate authorities to postpone for the time being, the issuing of regulations for which compliance is not possible.

B.5 Ecological environment

TC 55 endeavours to give due consideration to the effects that any standard it publishes and maintains may have on the environment. Particular attention and decisions have been taken in the preparation of test methods involving possible dangers to the test equipment operators, including the use of lead in soldering tests, and of refrigerants and oils in chemical tests. These methods provide precautions relating to exhaust fumes and hot temperatures.
In recent years, with the increased cost of copper, customers have attempted to limit their costs by reducing conductor sizes to those below established wire cross-sectional area tolerances. TC 55 strongly recommends the manufacture of energy efficient equipment, and for manufacturers of electrical and electronic equipment to maintain technically correct designs in order to avoid excessive heat dissipation over the life of the equipment, to sustain protection of the environment and energy savings.

TC 55 will also consider future amendments to standards for winding wire spools to encourage recycling. TC 55 regularly takes into account, the recommendations of IEC Guide 109. Since the main work of the Committee is to develop specifications that define the performance properties of winding wires, users are provided with the information needed to select a type of wire that both meets the appropriate functional requirements and has the least impact on the environment during processing or end use. In the broader sense, the Committee takes into consideration, the consequences of its decisions upon human health and well being, energy efficiency and renewable energies.

C System approach aspects

In general, the winding wire industry serves the role of material supplier to end product manufacturing industries represented in the following TC's:

IEC TC 2, Rotating machinery
IEC TC 14, Power transformers
IEC SC 61C, Safety of refrigeration appliances for household and commercial use
IEC TC 90, Superconductivity
IEC TC 91, Electronics Assembly Technology
IEC TC 96, Transformers, reactors, power supply units, and similar products for low voltage up to 1100 V
IEC TC 108, Safety of Electronic Equipment within the field of Audio/Video, Information Technology and Communication Technology

The winding wire industry is a supplier to, but also the customer of sectors represented in the following TC's:

IEC TC 112, Evaluation and Qualification of Electrical Insulating Materials and Systems
IEC TC 113, Nanotechnology standardization for electrical and electronic products and systems

Cooperation with these TC's is demonstrated through the exchange of documents and liaisons.

D Objectives and strategies (3 to 5 years)

Consideration will be given for new technologies, user requirements and environmental or economic influences. In an effort to improve the application and ease of use of the standards developed by the Committee, the structure of these standards is subject to review.

Along with its focus on new technologies described above, TC 55 will pay special attention to adjusting existing applicable standards to align with technological developments and improvements, where established quality levels shall reflect the current state of the art. The goal of TC 55 is to ensure that the customer gets, with reference to the applicable standards, a generally acceptable level of winding wire standards without reliance on customized standards.

Another concentration of work is in harmonization of the requirements of regional standards development bodies, to incorporate new or modify existing winding wire test methods, which will better satisfy more market areas so that the IEC 60851 series of test procedures is more broadly accepted and used.

Going forward, TC 55 WG1 will maintain its focus on general and specific requirements and test methods for fully insulated winding wires (FIW), in response to transformer producer requests for this special wire for safety applications. Also, efforts toward the standardization of special insulated (extruded wire) is underway.
Finally, TC 55 will continually examine its Programme of Work to withdraw specifications that are either no longer market relevant, or are outdated due to manufacturing capabilities and technology.

E Action plan

General requirements, particular specifications and test methods unique to triple insulated wires are planned for publication in 2015. New general requirements and particular specifications for polyester glass fibre covered bare or enamelled round copper winding wires are planned for publication in 2015.

F Useful links to IEC web site

[TC 55 dashboard](#) giving access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued along with their Stability Dates, Work Programme and similar information for SCs, if any.

Name or signature of the secretary

M. LEIBOWITZ