

## Basic Insulation Winding Wire “FSX-E” and Supplementary Insulation Winding Wire “FWX-E”

### 1. INTRODUCTION

The Internet that became popular among common people since around 1990 has promoted networking of not only information and communications equipment but also electro-electronic equipment in general. Thus recent years have seen forthcoming of new home appliances called “networking home appliances”. These new appliances require new safety standards since they are connected to telecommunications networks while they are fed power through electric power lines.

Heretofore, standards for telecommunications networks have been established according to the Telecommunications Business Law domestically and to the ITU Telecommunication Standardization Sector (ITU-T) and the like internationally. There are also safety standards for electro-electronic equipment laid down by the International Electrotechnical Commission (IEC), among which IEC 60950 “Safety of Information Technology Equipment” is known as a representative one. Further, Clause 6 of Amendment 3 of IEC 60950 2nd issued in 1995: “Connection to Telecommunication Networks” is the very standard specifying the safety of these electro-electronic equipment. To be more specific, the safety standard requires that there must be an insulation equivalent or superior to the Basic Insulation, between the TNV circuit --standing for Telecommunication Network Voltage-- of the communication side and the SELV circuit --standing for Safety Extra-Low Voltage-- of the electro-electronic equipment side, all being specified by the standard. In particular, since UL appointed in UL 1950 the effective date of the new safety requirement to be April 1, 2000, this safety requirement became widespread rapidly.

Meanwhile, the electro-electronic equipment together with the IT equipment belong to the area where things are remarkably shifting to lighter, thinner, shorter and smaller products in addition to efficiency enhancement and cost reduction. In such a situation, the new safety standard requires a small transformer of about 10-mm square --provided between TNV and SELV, and known by the name of TNV transformer-- to be insulated, thereby posing a serious problem in terms of its implementation, productivity degradation and cost increase.

Against this background, Furukawa Electric has developed and marketed a basic insulation winding wire “FSX-E” and a supplementary insulation winding wire “FWX-E”

in response to the new market requirements. The wires are based on the marketing expertise the company has acquired by the development of triple insulated winding wire with built-in reinforced insulation “TEX-E” and its series products, which were brought into the market place in January 1993.

### 2. FEATURES

FSX-E and FWX-E are fine insulated winding wires with the built-in Basic Insulation and Supplementary Insulation specified in IEC 60950, respectively. Their main applications are TNV transformers. Use of FSX-E or FWX-E eliminates interleaved insulation tape and barrier required to be provided between the primary and secondary circuits, thereby contributing to downsizing of transformers as well as cost reduction through efficiency enhancement and

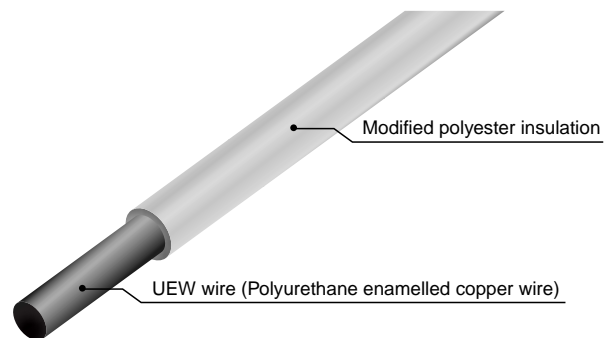


Figure 1 Construction of FSX-E.

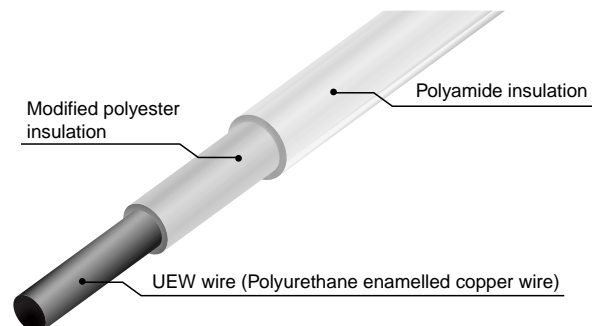


Figure 2 Construction of FWX-E.

**Table 1 Safety standards certifying FSX-E.**

Certification body	Approval No.	Insulation grade
UL	E206440 (OBJT2)	Basic insulation
CSA	185274	
VDE	Nr.123079	

**Table 2 Safety standards certifying FWX-E.**

Certification body	Approval No.	Insulation grade
UL	E206440 (OBJT2)	Supplementary insulation
CSA	185274	
VDE	Nr.139405	
NEMKO	P01102314	

productivity upgrading. They also contribute to the design of environment-friendly transformers by reducing the number of parts enabling ease of disassembly.

Below will be described their constructions and features.

### 2.1 Construction of Wire

FSX-E and FWX-E are fine insulated winding wires with a construction where modified polyester and/or polyamide resins --proprietary products developed by Furukawa Electric-- are uniformly extruded with a thickness of about 30  $\mu\text{m}$  per layer to provide insulation on polyurethane enamelled (UEW) copper wires 0.11~0.19 mm in diameter. See Figures 1 and 2.

The thermal resistance of the wires themselves is Class E, 120°C.

The manufacturable sizes are as follows:

FSX-E: 0.11~0.15 mm

FWX-E: 0.11~0.19 mm

### 2.2 Obtained Safety Certification

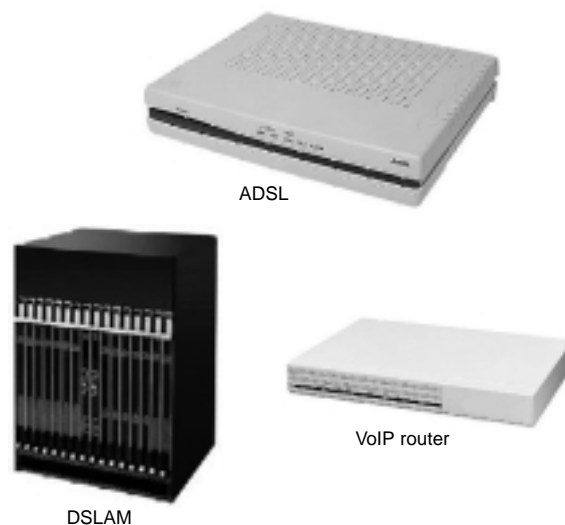
FSX-E and FWX-E pass the withstand-voltage test of 1500  $V_{\text{rms}}$  for 1 min stipulated in Sub-Clause 2.10.5.4 and Annex U of IEC 60950 3rd, and are usable in insulated transformers with an operating voltage of 354  $V_{\text{peak}}$  or DC. The wires have received approval from certification bodies as shown in Tables 1 and 2.

### 2.3 Solderability

FSX-E and FWX-E are directly solderable using a condition of about 420°C for 2 sec without removing the insulation.

### 2.4 Typical Applications

FSX-E and FWX-E can be used in insulated transformers for such IT equipment as ADSL, DSLAM and VoIP router, where basic insulation or supplementary insulation is needed. See Photo 1.

**Photo 1 Application examples.**

## 3. IN CONCLUSION

Basic insulation winding wire "FSX-E" and supplementary insulation winding wire "FWX-E" are insulated winding wires for insulated transformers in telecommunications equipment, being in conformity to international safety standards. They have been developed through the integration of Furukawa Electric's proprietary technologies of thermal-resistant insulation resin and uniform thin-thickness extrusion over fine wires.

We are committed to further offering of new products that meet market needs and are in compliance with international safety standards, including TEX-E, TEX-B and TEX-F --reinforced insulation wires commonly known as triple insulated winding wires.

For more information, please contact:

TEX Sec., Opto-Electronics Sales Dept., Marketing Div.

TEL: +81-3-3286-3144

FAX: +81-3-3286-3029

2nd Engineering Gr., Engineering Dept., Winding Wire Div.

TEL: +81-463-21-8243

FAX: +81-463-21-8244

or visit our website at:

<http://www.FSX-E.com>

<http://www.TEX-E.com>