



Lamitex® FR5 Tubes

FR-5 convolute wrapped tubes are constructed of a self-extinguishing halogen free epoxy resin and a woven glass fabric reinforcement with excellent resistance to chemicals, exceptional CTI 600) track resistance and retention of electrical properties in high humidity environments. FR-5 tubes are a low smoke and toxicity emissions composite whose 1.0" sheets meets Railway applications EN 45545-2; R22, R23 & R24: Classification HL3 insulation and construction material for railway, electrical machinery, transformers and chemical processing environments.

| <u>Mechanical Properties</u> | | <u>Standard</u> | <u>Test Specimen</u> | <u>Values</u> | |
|--|-------|----------------------------|--------------------------|------------------------|----|
| Flexural Strength | | ISO 178 | id>100 mm | 300 MPa / 43,510 psi | *1 |
| Compressive Strength, Axial | | ISO 604 | | 200 MPa / 29,000 psi | *1 |
| Cohesion between layers | | EN 61212-2 5.3 | id<100 mm | 400 MPa / 58,015 psi | |
| <u>Electrical Properties</u> | | | | | |
| Electric Strength in oil @ 90°C: | | | | | |
| Perpendicular to Laminations | | IEC 243-1 | 3 mm wall thk | 11.0 kV/mm - 279 Vpm | *2 |
| Parallel to Laminations | | IEC 243-1 | ≥3 mm wall thk | 60 kV/25 mm - 61 kV/in | *2 |
| Insulation resistance after immersion in water | | IEC 167 | id>8mm and or od>10mm | 10,000 M Ω | *4 |
| Permittivity: | 50Hz | IEC 250 | | 4.5 | *3 |
| | 1 MHz | IEC 250 | | 4.5 | *3 |
| Dissipation Factor: | 50Hz | IEC 250 | | 0.01 | *3 |
| | 1 MHz | IEC 250 | | 0.01 | *3 |
| Comparative Tracking Index | | EN 61212 | ≥3 mm | 600 CTI | *F |
| <u>Physical and Thermal Properties</u> | | | | | |
| Thermal endurance index @ 20,000 hrs. (T.I.) | | IEC 216 | | 180°C | |
| Fire Class | | IEC 60695-11-10 | ≥3 mm | V-O | *C |
| Density | | IEC 1183-A | All | 1.8 g/cm ³ | |
| Water Absorption (maximum) | | ASTM D229 | | 0.15% | |
| Smoke Emission & Toxicity | | EN 45545-2, R22, R23 & R24 | | HL3 | *F |
| Oxygen Index (OI) | | EN ISO 4589-2 | | ≥32 % | *F |
| Smoke Density (Ds max.) | | EN ISO 5659-2 | 25 mm | 1 | *F |
| Smoke Density (Ds max.) | | EN ISO 5659-2 | 1 mm | 106 | *F |
| Toxicity (CIT _{nlp}) | | NF X70-100-1/-2 | | 0.06 | *F |

IEC 212 Conditioning: 1: 24h @ 23°C & 50%RH

2: 24h @ 23°C & 50%RH + 1hr in oil at 90°C

3: 96h @ 105°C + 1hr @ 23°C & 20%RH

4: 24h @ 50°C + 24hr in water at 23°C

*C : Halogen Free

*F: Tested on laminated sheet of same pre-preg formulation

Availability: Grade FR5 is also manufactured as laminated sheet and fabricated custom parts.

All information and suggestions pertaining to the properties and uses of the materials described herein are based upon tests and data believed to be accurate; however, the final determination regarding the suitability of any material for such use is the sole responsibility of the user. No warranty is expressed or implied, including, without limitation, warrant of merchantability or fitness for a particular purpose. Under no circumstances shall Lamitex, LLC be liable for incidental or consequential loss or damage.

Composite Tubes • Bearings • Molded Shapes • Rotary Vanes • Fabricated Parts • Vulcanized Fibre • High Temp Insulation