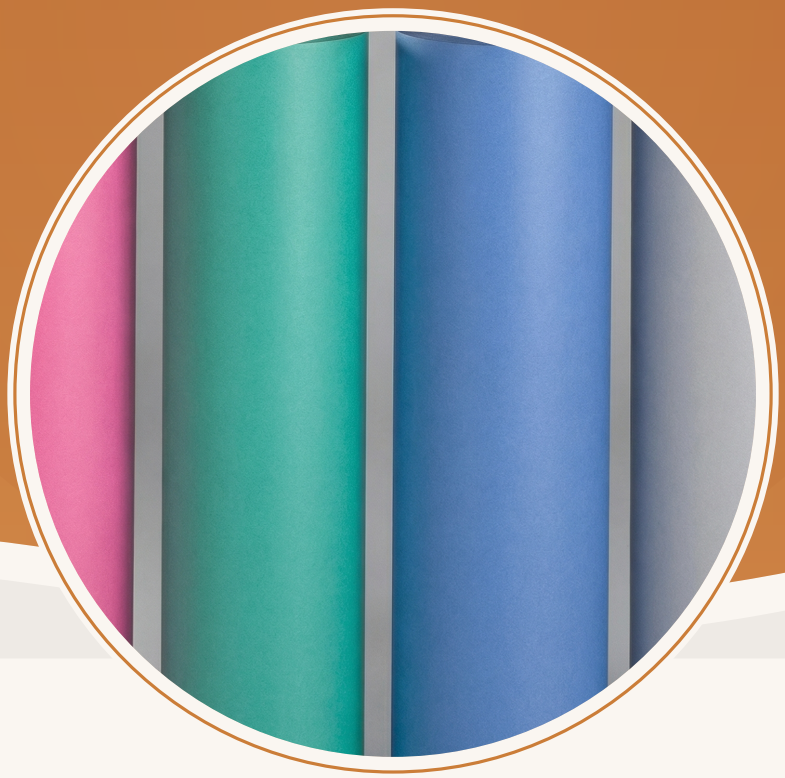
INSULATION MATERIALS

Flexible Laminates & Films / Thermal Class B -- F



About Our Insulation Materials

Universal Metals (Pvt.) Ltd manufactures flexible composite insulation materials for the electrical industry. Our products include film composite papers, DMD and NMN laminates, AMA papers, and BoPET base films, covering thermal classes B (130 °C) through F (155 °C) per IEC 60626 and GB/T standards.

These materials serve as critical insulation in motors, transformers, generators, and electrical appliances. Each product delivers the right combination of dielectric strength, mechanical toughness, and thermal endurance for its target application.

Applications

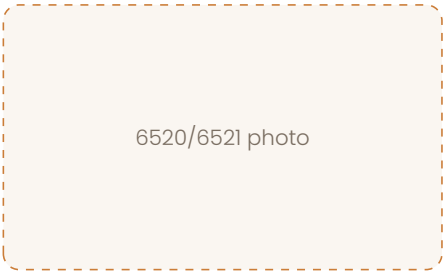
Our insulation materials serve the full spectrum of electrical machine and apparatus insulation:

- Slot & phase insulation in LV/MV motors
- Turn-to-turn insulation in transformers
- Interlayer insulation in dry-type transformers
- Slot closure & liner insulation
- Coil wrapping in generators
- Phase-to-phase insulation
- Electrical appliance insulation
- Cable insulation barriers

Film Composite Paper (6520 & 6521)

Reference: IEC 60626. Thermal Class E (120 °C).

Polyester film bonded with electrical-grade presspaper on one side (6520) or both sides (6521). Provides good mechanical strength and oil absorption properties for Class E motor and transformer insulation.



Thickness (mm)	Breakdown (kV)	Tensile (N/cm)	Moisture (%)
0.13	≥6.0	≥50	≤8.0
0.17	≥7.0	≥60	≤8.0
0.20	≥8.0	≥80	≤8.0
0.25	≥8.0	≥100	≤8.0
0.30	≥8.0	≥120	≤8.0
0.35	≥8.0	≥150	≤8.0

Standard width: 1000 mm. Custom widths available on request.

Key Features

- Excellent oil and varnish absorption from presspaper layers
- Good mechanical flexibility for slot insertion
- Cost-effective Class E insulation solution
- Available in thicknesses from 0.13 to 0.35 mm

DMD Insulation Paper (6641-F & 6630)

Reference: GB/T 5591.2, IEC 60626. 6641-F: Class F (155 °C). 6630: Class B (130 °C).

Three-layer laminate: polyester non-woven (D) + polyester film (M) + polyester non-woven (D). The non-woven layers provide excellent varnish and resin soakage for reliable bonding in motor slots.

Thickness (mm)	Breakdown (kV)	Tensile MD (N/cm)	Tensile TD (N/cm)
0.15	≥6.0	≥80	≥70
0.20	≥8.0	≥120	≥100
0.25	≥10.0	≥150	≥130
0.30	≥12.0	≥200	≥180
0.35	≥15.0	≥250	≥220

MD = Machine Direction, TD = Transverse Direction. Standard width: 914 mm.

Key Features

- Excellent varnish and resin soakage from non-woven layers
- 6641-F rated to Class F (155 °C) for high-temperature motors
- 6630 rated to Class B (130 °C) as an economy option
- Most versatile laminate in the product range

NMN Nomex Paper (6640)

Reference: IEC 60626. Thermal Class F (155 °C).

Three-layer laminate: DuPont Nomex® aramid paper (N) + polyester film (M) + Nomex paper (N). The premium Class F insulation with the highest dielectric strength in the laminate range, widely specified for traction motors and critical rotating machines.

Thickness (mm)	Breakdown Voltage (kV)	Tensile Strength (N/cm)
0.15	≥10.0	≥80
0.20	≥14.0	≥120
0.25	≥16.0	≥150
0.30	≥18.0	≥180
0.35	≥20.0	≥200
0.40	≥22.0	≥220

Standard width: 914 mm.

Key Features

- Highest dielectric strength of all laminate products
- Genuine DuPont Nomex® aramid paper layers
- Premium choice for Class F and Class H applications
- Excellent long-term thermal ageing resistance

AMA Insulation Paper

Reference: GB/T 5591.3.1, IEC 60626. Thermal Class F (155 °C).

Aramid paper (A) + polyester film (M) + aramid paper (A) laminate. A cost-effective alternative to NMN with comparable Class F thermal performance at a lower price, ideal where Nomex-level performance is needed but budget is constrained.

Thickness (mm)	Breakdown Voltage (kV)	Tensile Strength (N/cm)
0.12	≥8.0	≥60
0.15	≥10.0	≥80
0.20	≥14.0	≥120
0.25	≥16.0	≥150
0.30	≥18.0	≥180
0.35	≥20.0	≥200

Standard width: 914 mm. Similar Class F performance to NMN at lower cost.

Key Features

- Cost-effective substitute for NMN in Class F applications
- Comparable dielectric and thermal performance to NMN
- Aramid paper layers for high-temperature endurance
- Available in thicknesses from 0.12 to 0.35 mm

Reference Standards: ASTM D5213, IEC 60674. Thermal Class B to F (130 -- 155 °C).

Biaxially-oriented polyethylene terephthalate (BoPET) film is the base material in all composite insulation laminates. It provides the primary dielectric barrier with high breakdown strength per unit thickness. Available in multiple gauges as standalone insulation film or as the core layer in DMD, NMN, and AMA composites.

Physical & Electrical Properties

Property	Value	Unit
Dielectric Strength	200 - 300	kV/mm
Tensile Strength	150 - 215	MPa
Dielectric Constant (1 kHz)	3.0 - 3.3	-
Dissipation Factor	0.002 - 0.005	-
Density	1.39 - 1.40	g/cm^3
Moisture Absorption	<0.8	%
Operating Temperature	−60 to +150	°C

Available Thicknesses

Thickness (μm)	Thickness (mm)	Typical Use
12	0.012	Capacitor film, base layer
25	0.025	Standard insulation film
36	0.036	Motor slot liner base
50	0.050	Transformer insulation
75	0.075	Heavy-duty insulation
100	0.100	High-voltage barrier
125	0.125	Specialty applications

Quick reference for product selection across all insulation materials

Master Product Comparison

Product	Class	Temp (°C)	Thick. (mm)	Dielectric	Key Feature
6520/6521	E	120	0.13 - 0.35	6 - 8 kV	Economy, good oil absorption
DMD 6641-F	F	155	0.15 - 0.35	6 - 15 kV	Versatile, good soakage
DMD 6630	B	130	0.15 - 0.35	6 - 12 kV	Economy Class B option
NMN 6640	F	155	0.15 - 0.40	10 - 22 kV	Premium, Nomex-based
AMA	F	155	0.12 - 0.35	8 - 20 kV	NMN alternative, lower cost
BoPET Film	B-F	130-155	0.012 - 0.125	200-300 kV/mm	Base film, highest dielectric

Selection Guide by Application

- For Class E motors (120 °C): 6520/6521 Film Composite Paper
- For Class B motors (130 °C): DMD 6630
- For Class F motors (155 °C): DMD 6641-F, NMN 6640, or AMA
- For premium Class F/H applications: NMN 6640
- For cost-effective Class F: AMA (NMN substitute)
- For composite base material: BoPET Film

Dielectric values shown represent the range across available thicknesses. BoPET film dielectric is expressed per unit thickness (kV/mm) as it is a homogeneous film. Composite laminate dielectric values are total breakdown voltage across the full laminate thickness. For detailed specifications by thickness, refer to the individual product pages in this catalogue.

Packaging & Supply

All insulation materials are supplied on rolls with moisture-barrier packaging. Custom slitting to specified widths is available for all products. Standard packaging uses corrugated cartons on pallets, with each roll individually wrapped for moisture protection.

Metric	Film Composite	DMD / NMN / AMA	BoPET Film
Roll Width	1000 mm	914 mm	1000 mm
Custom Width	Available	Available	Available
Core ID	76 mm	76 mm	76 mm
Roll Weight	~50 kg	~50 kg	~30 kg
Packaging	Carton + Pallet	Carton + Pallet	Carton + Pallet

Storage & Handling

- Store in a cool, dry environment (15-30 °C, <65% RH)
- Keep away from direct sunlight and heat sources
- Store rolls vertically on end to prevent deformation
- Use within 12 months of manufacture for optimal properties
- Re-seal opened rolls in moisture-barrier packaging after use

Roll dimensions and weights are nominal values. Custom roll lengths, widths, and packaging configurations are available on request. All rolls are labelled with product grade, thickness, lot number, manufacture date, and net weight. Certificates of conformance provided with each shipment.