

## DuPont™ Nomex® 410 Paper, 12 mil Nominal Thickness

Category : Other Engineering Material , Composite Fibers , Polymer , Film , Thermoset , Aramid

### Material Notes:

Nomex® Type 410 is a calendared insulation paper which offers high inherent dielectric strength, mechanical toughness, flexibility, and resilience. It is the original form of Nomex® paper and is widely used in a majority of electrical applications. General NOMEX Information: Nomex® is a family of aromatic polyamide (aramid) fibers. This family consists of staple fibers, continuous filament yarns, paper, and spunlaced fabrics. The paper is produced from two forms of the aramid polymer. Small fibrous binder particles (fibrils) derived directly from the polymer under high shear conditions are mixed with short fibers (floc) which are cut to length from a fiber filament. The floc and fibrils are combined in a water based slurry from which a continuous sheet is produced on a specialized papermaking machine. This initial paper (as in Type 411) is low density and has poor properties. Subsequent densification and internal bonding is achieved by high temperature calendaring. The resulting paper is mechanically strong and has good electrical properties. Some uses for paper product include insulation in electric motors and transformers, wire wrapping, and honeycombed strength members in many aircraft. Nomex® brand fibers are inherently flame resistant: the flame resistance is a polymer property and does not diminish with the life of the fiber. Nomex® meta-aramid, poly(meta-phenyleneisophthalamide), is prepared from meta-phenylenediamine and isophthaloyl chloride in an amide solvent. It is a long chain polyamide in which at least 85% of the amide linkages are attached directly to two aromatic rings. The meta oriented phenylene forms bends in the polymer chain, reducing chain rigidity as compared to the para orientation in the chemically similar Kevlar® chain. This flexible polymer chain gives Nomex® more textile-like qualities while retaining high temperature properties similar to Kevlar®. Information provided by DuPont.

Order this product through the following link:

[http://www.lookpolymers.com/polymer\\_DuPont-Nomex-410-Paper-12-mil-Nominal-Thickness.php](http://www.lookpolymers.com/polymer_DuPont-Nomex-410-Paper-12-mil-Nominal-Thickness.php)

Physical Properties	Metric	English	Comments
Bulk Density	1.00 g/cc	0.0361 lb/in <sup>3</sup>	
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Thickness	305 microns	12.0 mil	Nominal
	310 microns	12.2 mil	Typical; ASTM D374

Mechanical Properties	Metric	English	Comments
Film Elongation at Break, MD	22 %	22 %	ASTM D828
Film Elongation at Break, TD	17 %	17 %	ASTM D828
Tear Strength, Total	55.0 N	12.4 lb (f)	Initial in TD; ASTM D1004
	93.0 N	20.9 lb (f)	Initial in MD; ASTM D1004
Elmendorf Tear Strength, MD	2.44 g/micron	62.0 g/mil	Calculated from mfr's report of 7.4 N per TAPPI-414 and the typical thickness
			Calculated from mfr's report of

Elmendorf Tear Strength, TD Mechanical Properties	4.69 g/micron Metric	119 g/mil English	14.2 N per TAPPI-414 and the typical thickness Comments
Film Tensile Strength at Break, MD	122 MPa	17700 psi	Calculated from mfr's report of 378 N/cm per ASTM D828 and the typical thickness
Film Tensile Strength at Break, TD	63.3 MPa	9180 psi	Calculated from mfr's report of 196 N/cm per ASTM D828 and the typical thickness

Thermal Properties	Metric	English	Comments
Maximum Service Temperature, Air	220 °C	428 °F	220°C insulation by UL, the US Navy, and other tests
Oxygen Index	27 - 32 %	27 - 32 %	Range at RT for Type 410; depends on thickness and density
Shrinkage, MD	0.40 %	0.40 %	at 300°C
Shrinkage, TD	0.20 %	0.20 %	at 300°C

Electrical Properties	Metric	English	Comments
Volume Resistivity	2.00e+16 ohm-cm	2.00e+16 ohm-cm	50% RH; tested on 10 mil thickness sample; ASTM D257
Surface Resistivity per Square	2.00e+16 ohm	2.00e+16 ohm	tested on 10 mil thickness sample; ASTM D257
Dielectric Constant	2.9 @Frequency 60 Hz	2.9 @Frequency 60 Hz	ASTM D150
Dielectric Strength	32.0 kV/mm	813 kV/in	AC Rapid Rise; ASTM D149
Dissipation Factor	0.0070 @Frequency 60 Hz	0.0070 @Frequency 60 Hz	ASTM D150

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