

# NOMEX® PAPER AND PRESSBOARD: A RANGE OF ENGINEERING MATERIALS

## TECHNICAL DATA SHEET

NOMEX® is a synthetic aromatic polyamide polymer that provides high levels of electrical, chemical and mechanical integrity over a wide range of temperatures when converted into its various sheet forms.

The polymer is made into floc (short fibers to provide mechanical strength) and fibrils (microscopic filmy particles serving as binder and filler) which are then combined together to form sheet structures through specialized paper and board making methods.

In most cases the NOMEX® brand paper and boards are densified (by a calendering operation) at high temperature and pressure to permanently lock the components together and produce a relatively impermeable structure with high levels of mechanical properties.



- Self extinguishing
- Tear resistant
- Tough
- -196 to +300°C
- Formable
- Radiation resistant
- Non-toxic
- Heat barrier
- Electrical insulation

## General properties

The exceptional stability of the NOMEX® polymer provides a unique range of properties common to all NOMEX® products:

- Usable in a wide range of temperatures from -196°C to over 300°C
- Chemical resistance to acids, alkalies, solvents
- Broad compatibility with industrially used oils, resins, adhesives, refrigerants
- Accommodates most inks, paints, laminates or metal coatings
- Radiation resistant (no affect at 800 megarads)
- Resistant to insects, molds and fungi
- No toxic reactions to humans or animals noted in laboratory tests
- Self-extinguishing, it does not support combustion
- Does not drip or melt when heated or burned
- Bondable with ultrasonic welding
- Can be shaped in 3D configurations

## Applications

Primarily used by the electrical industry, the unique combination of properties of the NOMEX® products helps designers to find new solutions in a wide range of applications such as gaskets, packaging, thermal barriers, noise/vibration dampeners, cryogenic supports, labels, parchment replacement, etc.

## Range of products

NOMEX® is originally produced in the form of paper and boards, but it is also available in a large variety of converted products such as combinations with film or metal sheets, or material pre-treated with resins or adhesives.

NOMEX® is also produced in the form of staple and filament which are then trade converted into felts and fabrics.

### NOMEX® brand pressboard

Increased thickness and rigidity set NOMEX® pressboard apart from the other forms of NOMEX®. These products offer an attractive range of mechanical properties and thermal protection. Pressboard can also be easily cut, punched, folded, printed, sprayed or glued to other materials. NOMEX® pressboard is produced in sheets of a maximum of 3.2 x 6.3 m (10 feet x 20 feet), and it is commercially offered in sub-multiple sheets or in pieces punched to design in three grades of density: low (T992), medium (T993) and high density (T994).

### NOMEX® brand paper

NOMEX® paper is a tough, flexible material which can be easily cut, punched, folded, printed or glued to other materials.

NOMEX® paper is produced in rolls of a maximum width of 1828 mm (72 inches), and it is commercially offered in any specified width required by users from a minimum of 6 mm (.25 inch). Four types are most commonly used:

- **Type 410:** calendered, it is available in thicknesses from 0.05 to 0.76 mm (2 to 30 mil). This type provides the best mechanical properties, and it is the most widely used version.
- **Type 411:** non-calendered, it is available in thicknesses from 0.13 to 0.58 mm (5 to 23 mil). This type is often used as soft cushioning material or when conformability and impregnability are of importance.
- **Type 414:** calendered, it is available in thicknesses from 0.09 to 0.38 mm (3.4 to 15 mil). This type provides improved flexibility and conformability vs. Type 410, and more strength than Type 411.
- **Type 418:** calendered, this type contains 50% in weight of inorganic mica, and it is produced in a thickness range between 0.08 and 0.36 mm (3 and 14 mil). The mica content provides improved corona resistance for electrical applications, as well as enhanced flame resistant behavior (LOI of ~63%).

Type 410		Type 411		Type 414		Type 418		Type 992		Type 993		Type 994	
Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )	Thickness (mm)	Basis Weight (g/m <sup>2</sup> )
0.05	41	—	—	—	—	—	—	—	—	1.0	720	1.0	1148
0.08	63	—	—	0.09	83	0.08	89	1.6	810	1.5	1050	1.5	1708
0.13	116	0.13	42	—	—	0.13	148	—	—	2.0	1530	2.0	2310
0.18	175	0.18	64	0.18	176	0.20	237	—	—	2.4	1770	2.5	2876
0.25	249	0.25	82	0.25	252	0.25	301	3.2	1630	3.0	2270	3.0	3448
0.30	309	—	—	0.30	309	—	—	—	—	—	—	3.2	3657
0.38	397	0.38	134	0.38	398	0.36	397	—	—	4.0	3410	4.0	4554
0.51	547	—	—	—	—	—	—	—	—	—	—	4.8	5484
0.61	693	0.58	205	—	—	—	—	—	—	—	—	5.0	5691
0.65	696	—	—	—	—	—	—	—	—	—	—	6.0	6768
0.73	854	—	—	—	—	—	—	—	—	—	—	6.4	7148
0.76	847	—	—	—	—	—	—	—	—	—	—	7.0	8039
—	—	—	—	—	—	—	—	—	—	—	—	8.0	9068
—	—	—	—	—	—	—	—	—	—	—	—	9.6	11069

## NOMEX® BRAND PAPER AND PRESSBOARD - TYPICAL MECHANICAL PROPERTIES

Type			T410	T410	T410	T411	T414	T418	T992	T993	T994
Nominal Thickness	mm		0.05	0.25	0.76	0.25	0.25	0.25	1.6	1.5	1.5
	mils		2	10	30	10	10	10	63	59	59
Specific Gravity	g/cc		0.72	0.96	1.1	0.31	0.95	1.15	0.52	0.73	1.15
Tensile Strength	N/cm	MD	39	285	841	35	229	111	352	600	1800
		XD	18	152	595	20	119	78	288	495	900
Tensile Strength	N/cm <sup>2</sup>	MD	7800	11400	11070	1400	9160	4440	2200	4000	12000
		XD	3600	6080	7830	800	4760	3120	1800	3300	6000
Elongation	%	MD	9	19	17	3.4	13	3.8	9.1	11.2	8.0
		XD	6	15	13	5.2	16	3.8	9.4	12.9	8.0
Initial Tear Strength	N	MD	11	71	251	13	73	34			
		XD	6	42	200	8	38	24			
Elmendorf Tear Str.	N	MD	0.8	6.0		1.9		4.9			
		XD	1.6	10.8		2.5		6.3			
Shrinkage at 300°C	%	MD	2.2	0.4	0.2		1.5	0.1			
		XD	0.1	0.1	0.0		0.4	0.0			
LOI	%	at 25°C	29	30	32	29	30	63	39	32	30+
		at 220°C	22	24	25	22	24	52			
Thermal Conductivity	W/m <sup>2</sup> K	at 150°C	0.094	0.128	0.178	0.103		0.092	0.066	0.086	0.172

## NOMEX® BRAND PAPER AND PRESSBOARD - TYPICAL ELECTRICAL PROPERTIES

Type			T410	T410	T410	T411	T414	T418	T992	T993	T994
Nominal Thickness	mm		0.05	0.25	0.76	0.25	0.25	0.25	1.6	1.5	1.5
	mils		2	10	30	10	10	10	63	59	59
<b>Dielectric Strength</b>											
AC Rapid Rise	kV/mm		17	32	27	9	29	38	16	34 Oil	27 Oil
Full Wave Impulse	kV/mm		39	63	49	18	51	67	27	73 Oil	70 Oil
Dielectric Constant	at 60 Hz		1.6	2.7	3.7	1.2	2.7	4.1	1.7 Dry	3.2 Oil	4.4 Oil
Dissipation Factor	at 60 Hz (x10 <sup>-3</sup> )		4	6	7	3	8	6 Dry	10 Dry	5 Oil	7 Oil

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