Kite Brand TUFNOL

Paper based laminate

Resin: Phenolic resin.
Reinforcement: Kraft paper

Description: Kite Brand TUFNOL is a first class electrical insulating material with good dielectric strength and high insulation resistance (tested after immersion in water for 24 hours). It has low moisture absorption and good mechanical strength, although its impact strength is lower than that of most other grades of TUFNOL. Kite Brand meets British Standard BS 2572 Type P3, equivalent to the former British Standards BS 5102 Type 1 and BS 1137 Type 1, which were widely used in the electrical industry for many years. It is readily machined and can be hot punched in thicknesses up to 3.2mm (1/8").

Typical Uses: Kite Brand is the most widely used of all TUFNOL grades, wherever a good quality general purpose electrical insulation material is required. It is used for a multitude of different purposes at low, medium and high voltages, including such items as terminal boards, mounting panels, tag strips, coil formers, insulating sleeves and bushes, busbar supports, tool and instrument handles, coil supports, insulated enclosures, brush holders, insulating spacers and special purpose plugs and sockets. Paper based components are not normally used for items where optimum wear resistance is required.

Types available: Sheet and all hollow sections (e.g. tube) are available in natural colour and in black. (Where solid sections are required, such as round rod and square bar, Swan Brand TUFNOL is used.)

SHAPES AND SIZES

Sheet

Thickness: 0.8 to 25.4mm (1/32" to 1")
Thicknesses over 25.4 mm up to 50.4 mm are subject to special enquiry.

Sheet Sizes: 1220 x 1220mm approx.
1600 x 1220mm approx.
For guaranteed minimum sheet sizes, refer to TUFNOL Ltd. For 1600 mm long sheets, minimum order quantities may apply.

Round Tube

Inside diameter: 3.2 to 203.2mm (1/8" to 8")
Outside diameter: 6.3 to 228.6mm (1/4" to 9")
Wall thickness must be less than inside diameter.
Length approx 584 for o.d. up to 15.1mm
1200 for o.d. 9.5 to 120.6
584 for o.d. 101.6 to 228.6

Rectangular Tube

Internal size: 4.8 x 4.8mm to 69.8 x 69.8mm (3/16" x 3/16" to 2 3/4" x 2 3/4")
Lengths approx: 584mm for size 9.5 x 9.5 or smaller
1200mm for sizes larger

Channel

Cut from rectangular tube. Deduct 3.2mm from relevant internal dimension to allow for tool cut.

Angle

Outside size: 6.3 x 9.5mm to 149.2 x 149.2mm (1/4" x 3/8" to 5 7/8" x 5 7/8")
Wall thickness 1.6 to 9.5mm (1/16" to 3/8")
Length approx 1200mm

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SPECIFICATIONS

BRITISH STANDARDS

Sheet	BS2572 Type P3
RoundTube	BS6128 Part 9 Type PF CP 91
RectangularTube	BS6128 Part 13 Type PF CP 131

ADMIRALTY

Sheet	NES 2053
RoundTube	NES 2054

NEMA*

Sheet	Nema LI-1-1983 Type XXX
RoundTube	Nema LI-1-1983 Type XXX

MIL*

Sheet	MIL-I-24768
RoundTube	MIL-I-24768

*Certification to these standards is subject to special enquiry. Standard quality testing is to British Standards.

APPROXIMATE WEIGHTS

Sheets

Sheet size 1220 x 1220 approx.
Approx. weight in kg = 2.10 x thickness in mm

Sheet size 1600 x 1220 approx.
Approx. weight in kg = 2.76 x thickness in mm

Due to slight variations in density and nominal dimensions, weight cannot be calculated precisely.

Weight Formulae

Cut pieces:

$$\text{Weight in kg} = \frac{1.40 \times \text{Length} \times \text{Width} \times \text{Thickness (all in mm)}}{1{,}000{,}000}$$

Tube

$$\text{Weight in kg} = \frac{1.07 \times (\text{o.d.}^2 - \text{i.d.}^2) \times \text{Length (all in mm)}}{1{,}000{,}000}$$

PHYSICAL PROPERTIES OF KITE BRAND

SHEET

PROPERTY	TYPICAL RESULT	UNITS
Cross breaking strength	175	MPa
Impact strength, notched, Charpy	2.7	kJ/m^2
Compressive strength, flatwise	350	MPa
Compressive strength, edgewise	200	MPa
Resistance to flatwise compression	1.2	%
Shear strength, flatwise	105	MPa
Water absorption 1.6mm thk.	39	mg
3mm thk.	47	mg
6mm thk.	56	mg
12mm thk.	70	mg
Electric strength, flatwise in oil at 90° C		
1.6mm thk.	14.5	MV/m
3mm thk.	13	MV/m
6mm thk.	8.8	MV/m
12mm thk.	6.1	
Electric strength, edgewise in oil at 90°C	55	kV
Insulation resistance after immersion in water	$1x10^{10}$	ohms
Loss tangent at 1 MHz	0.037	-
Permittivity at 1 MHz	5.1	-
Relative density	1.36	-
Maximum working temperature**		
continuous	90	°C
intermittent	120	°C
Thermal classification	Class E	-
Thermal conductivity through laminae	0.26	W/(mK)
Thermal expansion in plane of laminae	1.8	$x10^{-5}/K$
Specific heat	1.5	kJ/(kgK)

Test methods as BS2572, where applicable.

ROUND TUBES

PROPERTY	TYPICAL RESULT	UNITS
Axial compressive strength	190	MPa
Cohesion between layers	110	MPa
Water absorption	1.0	mg/cm^2
Insulation resistance after immersion in water	$1x10^9$	ohms
Axial electric strength in oil at 90 °C	40	kV
Radial electric strength in oil at 90 °C		
1.6 wall	8	MV/m
3.0 wall	6	MV/m
Relative density	1.35	-

Test methods as BS 6128.

**Users of highly stressed components at temperatures approaching the maximum are recommended to seek further advice from TUFNOL Ltd.

The information in this leaflet is believed to be correct, but completeness and accuracy are not guaranteed. The user shall be fully responsible for determining the suitability of products for the intended use. TUFNOL is a Registered Trade Mark.

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A full machining service is available for this and many other engineering plastics and composites.

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BS 5750 Part 2
(ISO 9002)
Reg. No. Q5697

Infomation sheet No PR10. Printed 5-9-94