TUFNOL

GRADE 10G

40, 41, 42, 44

SRBGF Material
Synthetic Resin Bonded Glass Fabric

Epoxy Glass Fabric laminate
Glass fibre/epoxide resin laminated plastic

SRBGF Material. GRADE 10G.

Top quality materials for mechanical and electrical applications.

The TUFNOL range of high quality epoxy resin bonded glass fabric laminates offer very high mechanical strength and low moisture absorption, combined with excellent electrical properties, under both dry and humid conditions. They are rigid materials with good dimensional stability and good resistance to a wide range of working environments. Four standard grades are available:

- TUFNOL Grade 10G/40 - The most widely used grade, suitable for continuous use at temperatures up to approximately 130°C. (Class B).
- TUFNOL Grade 10G/41 - Similar to 10G/40, but with comtrolled flammability
- TUFNOL Grade 10G/42 - Made with an epoxy resin which offers increased mechanical strength at higher temperatures. Suitable for uses up to 155 °C (Class F).
- TUFNOL Grade 10G/44 - Similar to Grade 10G/42, but with improved retention of strength after heat ageing.

What are TUFNOL epoxy glass fabric materials used for?

These high performance materials are used for a very wide variety of applications where high strength, rigidity dimensional stability and electrical performance are required. Applications such as insulation in large turbine generators, components for cryogenic superconducting magnets, high strength bolt insulation in structures, jigs for electro-chemical machining and structural insulation for high performance electronic equipment, these are typical of the many uses to which this material is put. However, due to the abrasive nature of the high glass fibre content, epoxy glass grades are not normally selected for wearing or bearing applications.

Types available

	Sheets	Rods	Tubes	Other Sections
GRADE 10G/40 Natural colour	Yes	Yes	No	No
GRADE 10G/41 Natural colour	Yes	No	No	No
GRADE 10G/42 Natural colour	Yes	No	No	No
GRADE 10G/44 Natural colour	Yes	No	No	No

Specifications for GRADE 10G

British Standards	Current Standards	Recent Standards (now obsolete)
Grade 10G/40 Sheet	BS EN 60893-3-2 Type EP GC 201	BS 3953 Type EP-3
Grade 10G/40 Round Rod (Rolled & Moulded)	BS EN 61212-3-3 Type EP GC 41 & BS 6128 Part 2 Type EP GC 21 42	-
Grade 10G/41 Sheet	BS EN 60893-3-2 Type EP GC 202	BS 3953 Type EP-4
Grade 10G/42 Sheet	BS EN 60893-3-2 Type EP GC 203	BS 3953 Type EP-5
Grade 10G/44 Sheet	BS EN 60893-3-2 Type EP GC 203 & BS 3953 Type EP-7	(BS 3953 will shortly become obsolete.)
NEMA*		
Grade 10G/40 Sheet & Rod	NEMA LI-1-1983 Type G10	-
Grade 10G/41 Sheet	NEMA LI-1-1983 Type FR4	-
Grade 10G/42 Sheet	NEMA LI-1-1983 Type G11	-
Grade 10G/44 Sheet	NEMA LI-1-1983 Type G11	-

*Testing and certification to these standards is subject to special enquiry. Standard quality testing is to British Standards.

Physical Properties

Property	GRADE 10G/40	GRADE 10G/41	GRADE 10G/42	GRADE 10G/44	Units
	Typical Result	Typical Result	Typical Result	Typical Result	
Cross breaking strength	490	470	490	490	MPa
Cross breaking strength at 150°C - (after 1 hour at 150°C)	-	-	350	360	
Cross breaking strength at 150°C - (after 100 hours at 200°C)	-	-	-	250	
Impact strength, notched, Charpy	60	60	60	60	kJ/m²
Compressive strength, flatwise	415	415	415	415	MPa
Compressive strength, edgewise	300	300	300	300	MPa
Tensile strength	355	-	-	-	MPa
Young's modulus	17.7	-	-	-	GPa
Water Absorption					
- 1.6mm thk.	5	5	5	5	mg
- 3mm thk.	7	7	7	7	mg
- 6mm thk.	10	10	10	10	mg
- 12mm thk.	15	15	15	15	mg
Electric strength, flatwise in oil at 90°C					
- 1.6mm thk.	17	17	17	17	MV/m
- 3mm thk.	15	15	15	15	MV/m
- 6mm thk.	12	12	12	12	MV/m
Electric strength, edgewise in oil at 90°C	75	75	70	70	kV
Insulation resistance after immersion in water	1 x 1011	5 x 1010	5 x 1010	5 x 1010	ohms
Loss tangent at 1 MHz	0.017	0.017	0.017	0.017	-
Permittivity at 1 MHz	5.0	4.9	5.2	5.2	-
Relative density	1.90	1.95	1.90	1.90	-
Comparative tracking index	285	260	290	290	-
Maximum working temperature**					
- continuous	130	130	140	140	°C
- intermittent	150	150	155	155	°C
Thermal classification	Class B	Class B	Class F	Class F	-
Thermal conductivity through laminae	0.42	0.42	0.45	0.45	W/(mK)
Thermal expansion in plane of laminae	1.1	1.0	1.2	1.2	x 10^{-5}/K

Test methods as BS EN 60893-2, where applicable.

GRADE 10G/40
Round Rod

Property	Typical Result	Units
Flexural strength	600	MPa
Water absorption	0.5	mg/cm²
Insulation resistance after immersion in water	5 x 109	ohms
Axial electric strength in oil at 90°C	70	KV
Relative Density	1.90	-

Test methods as BS EN 61212-2, where applicable.

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

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Reliability in the field of engineering plastics & composites.

Tufnol is the byword for quality in laminated plastics and resin based materials for engineering applications. It was invented here in the UK and its development to meet modern engineering demands continues to keep it abreast of 21st century technology.

This type of material is known as 'synthetic resin bonded laminated plastic', and is made from layers of paper, cotton cloth or woven glass fibre cloth, dipped in resin, then compressed and bonded together in a hot press. It is a strong, hard material, made in a number of different grades with varying properties and uses.

Tufnol's reliability is key to the many sectors of engineering industry in which it serves.

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