

KOBELITE LAMINATE

KEL-GEF

Glass epoxy laminates

■ Features

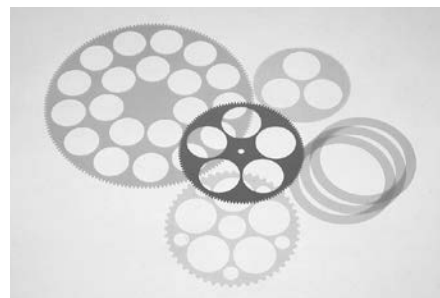
- Precise thickness and low warpage compared to the standard epoxy glass laminates.

■ Applications

- Retaining board for polishing
- DAM substrate

■ Polishing products

- Hard disk



■ Standard Specifications

Part Number	Type	Master Size (Length×Width) (mm)	Actual Thickness (mm)
KEL-GEF	—	1020 ⁺⁵ ₋₀ ×1020 ⁺⁵ ₋₀	0.1
			0.2
			0.3
			0.4
			0.5
			0.6
			0.7
			0.8
			1.0
			1.2
			1.5
			1.6
			2.0
			2.5
			(R)
	0.3		
	0.4		
	0.5		
	0.6		
	0.7		
	0.8		
	1.0		
	1.2		
	2.0		
	2.5		

※Please consult in advance for production support.

■ Characteristics

Item	Condition	Unit	Actual Value	
			KEL-GEF/KEL-GEF(R)	
Withstand Voltage Vertical To Layer	C-90/20/65	kV/mm	18~30	
Insulation Resistance	C-90/20/65	Ω	1×10 ¹⁴ ~1×10 ¹⁵	
	C-90/20/65+D-2/100		1×10 ¹⁴ ~5×10 ¹⁴	
Dielectric Constant	(1MHz)	—	C-90/20/65	4.5~5.0
	C-90/20/65+D-24/23		4.6~5.1	
Dissipation Factor	(1MHz)	—	C-90/20/65	0.016~0.025
	C-90/20/65+D-24/23		0.020~0.026	
Flexural Strength	Length	A	N/mm ²	600~650
	Width			450~500
Flexural Modulus	Length	A	kN/mm ²	22~24
	Width			19~22
Compressive Strength	vertical	A	N/mm ²	400~550
	parallel			250~300
Izod impact strength	A	J/cm	5.00~6.50	
Cleavage Strength	A	kN	7.84~9.81	
Air Flammability	E-2/180	—	No abnormality	
Specific Gravity	A	—	1.7~1.9	
Chemical Resistance	HCl	(*1)	—	No abnormality
	NaOH			No abnormality
Flammability	(UL-94)	A	—	94V-0
Aptitude Punching Temperature	A	°C	—	
CTE *2	X	(30~80°C)	ppm/°C	12~14
	Y			14~16
	Z			50~70

The contents of this report are based on the results of experiments conducted by HITACHI CHEMICAL and do not represent a guarantee of the values for each property. Before use, please study its properties, methods for using it, etc., using this data as a reference.

*1) Concentration: 3±0.2%, 20±2°C. Appearance checked with naked eyes after soaking for 24hrs.

*2) Heating Rate: 10°C/min.

■ Table of general characteristics

Item	Part Number	KEL-GEF (R)
Tear strength (N/mm)		17
Tencile strength (N/mm ²)		320
Flexural strength (N/mm ²)		600
Flexural modulus (kN/mm ²)		22

The above values are measurements taken from samples 1.0mm thickness, but not guaranteed.

■ Table of article numbers

Part Number		KEL-GEF		
Division		—	(R)	
Item	Resin	Epoxy		
	Base material	Glass fabric		
	Color	Natural color		
	Grades	JIS	EL-GEF	
		ANSI	FR-4.0	
	UL	94V-0		
	Features	Good insulation resistance Good strength High precision thickness		
	Applications	Insulation spacer, FPC brace board , Retaining board for polishing		
	Thickness(mm)	0.1~20.0	0.2~2.5	
Size(mm)	1,020×1,020			

■ Actual thickness and tolerance

Actual thickness	JIS tolerance	KOBELITE tolerance	
		KEL-GEF	KEL-GEF(R)
0.1	—	±0.02	—
0.2	—	±0.02	±0.02
0.3	—	±0.10	±0.03
0.4	—	±0.10	±0.03
0.5	±0.12	±0.10	±0.03
0.6	±0.13	±0.12	±0.03
0.7	±0.15	±0.15	±0.04
0.8	±0.15	±0.15	±0.04
1.0	±0.15	±0.15	±0.05
1.2	±0.20	±0.20	±0.20
1.5	±0.20	±0.20	±0.20
1.6	±0.23	±0.23	±0.20
2.0	±0.25	±0.25	±0.20
2.5	±0.30	±0.30	±0.20

Actual thickness	JIS tolerance	KEL-GEF
3.0	±0.35	±0.35
4.0	±0.40	±0.40
5.0	±0.55	±0.55
6.0	±0.60	±0.60
8.0	±0.70	±0.70
10.0	±0.80	±0.80
12.0	±0.90	±0.90
15.0	±1.10	±1.10
16.0	±1.10	±1.10
20.0	±1.30	±1.30

1. In case laminate thickness lies in between two thickness figures shown above, the tolerance of such laminate would be equal to the tolerance of the thicker one.
 2. Thickness guarantee area is 920×920mm, center of 1020×1020mm (Only KEL-GEF(R))

■ Water absorption(JIS K 6912)

● Condition:E-24/50+D-24/23

Part Number	Unit (%)	
	KEL-GEF	EL-GEF
0.5	1.00	
0.8	0.80	
1.6	0.35	
2.0	0.30	
2.5	0.25	
3.0	0.20	
5.0	0.15	
6.0	0.13	
12.0	0.10	
20.0	0.10	

■ Warp & Twist

Unit (%)

Standard Thickness(mm)	The ratio of the warp & twist against 1000mm	
	KOBELITE	JIS
0.8 ≤ 1.6 ≥	3.50 ≥	—
1.6 < 3.0 ≥	2.00 ≥	3.00 ≥
3.0 < 5.0 ≥	1.20 ≥	1.30 ≥
5.0 < 7.0 ≥	1.00 ≥	
7.0 < 10.0 ≥	0.60 ≥	0.65 ≥
10.0 < 15.0 ≥	0.50 ≥	
15.0 < 20.0 ≥	0.40 ≥	