

Fluon[®] Perfluoro Adhesive (Semi-commercial product) EA-2000

Introduction

Fluon[®] PFA EA-2000, is an Perfluoro resin which has been functionalized to include an adhesive group within the polymer backbone. The perfluoro backbone gives the material excellent electrical characteristics, and heat and chemical resistance, while the adhesive functionality facilitates adhesion to other materials in a one-step process, without the need for surface treatment or a separate adhesive layer. Example materials include glass cloth, polyimide, or various metals. This grade is semi-commercialized and may be available upon request. This material is supplied as pellets and packaged in 25kg plastic bags.

Features of EA-2000

- Heat resistance to 260C and superior chemical resistance, equivalent to conventional PFA materials
- Adhesion to other polymers and metals without the use of surface treatment or a separate adhesive layer via a traditional melt-processable method.
- Excellent non-stick properties, low frictional properties, and water and oil repellency (high contact angle)
- Low dielectric constant (2.1) and low dissipation factor (0.001)

Assumed Applications of EA-2000

- Printed circuit boards (rigid or flexible)
- Heat-resistant insulating tape
- Heat-resistant laminated tubing
- Interposers
- Steel plate laminates



Ideal for PCB materials

Fluon® Perfluoro Adhesive EA-2000

Example of Film Extrusion Conditions of EA-2000

An example of the processing conditions for a mono-layer film with EA-2000 is shown below.

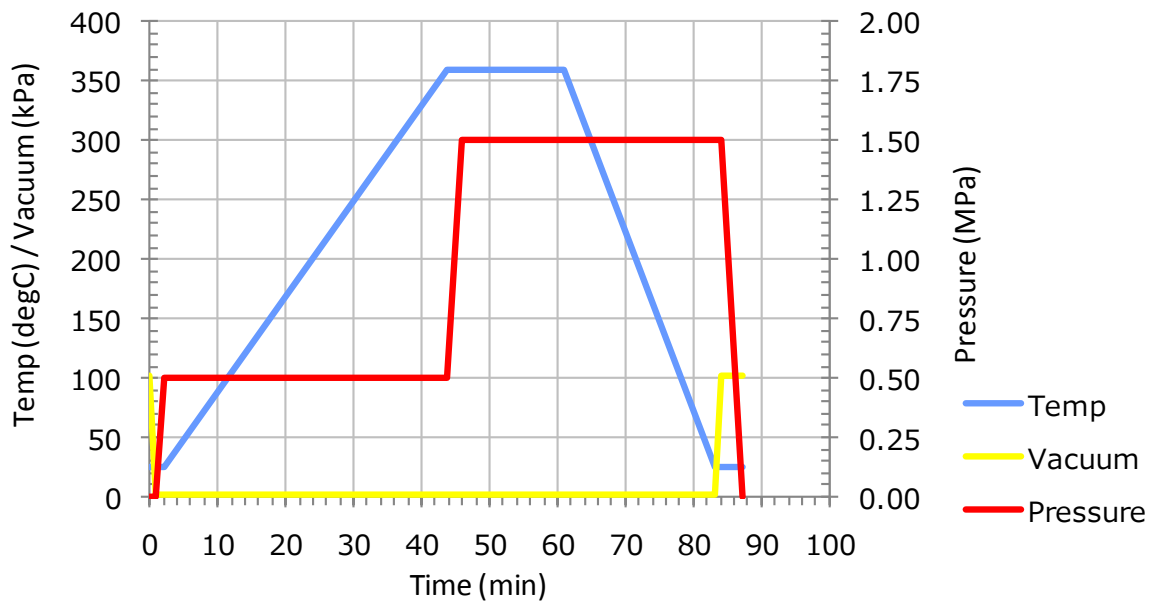
Conditions	Extruder temperature						Roll temperature
	C1	C2	C3	C4	H	D	Nip roll temperature
EA-2000	300°C	320°C	340°C	340°C	340°C	340°C	180°C

- Extruder: ϕ 30 mm single screw (L/D=24)
- Die: T-die (450 mm in width)
- Line speed: 10 m/min

Example of Molding Conditions of EA-2000/Copper Foil Laminate

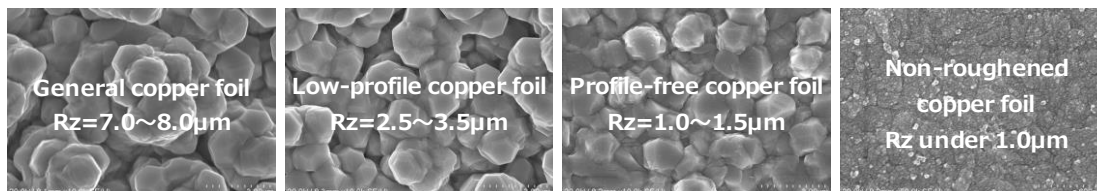
An example of the processing conditions for copper foil laminate with EA-2000 is shown below.

- Film: EA-2000 (30 μ m-t)
- Metal Laminate: Copper foil
- Laminate conditions: An adhesion sample (350 mm) is produced using a vacuum press.



- Peel strength measurement method: 90° peel test using 1 cm wide strips.

	Cu surface roughness		Peel strength (N/cm)
	Rz (μ m)	Ra (μ m)	
EA-2000/General copper foil	7.2	1.45	13
EA-2000/Low-profile copper foil	3.0	0.25	11
EA-2000/Profile-free copper foil	1.2	0.19	12
EA-2000/Non-roughened copper foil	0.9	0.13	12



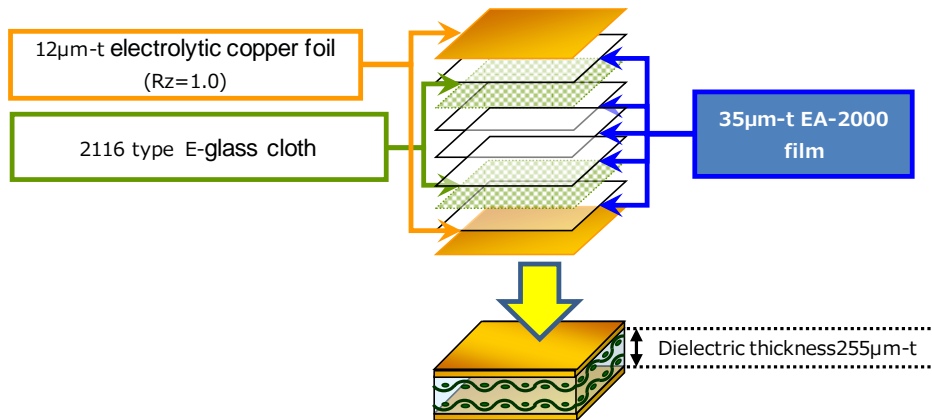
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Example Molding Conditions of EA-2000/Glass Cloth

EA-2000/glass cloth substrate molding conditions

- Film: EA-2000 (35 μm-t)
- Copper foil: Electrolytic copper foil roughened surface Rz=1.2 μm (12 μm-t)
- Glass cloth: 2116 type E-glass cloth
- Laminate conditions: A substrate sample (350 mm) will be produced with the same conditions using a vacuum press.

Material composition



Characteristics of EA-2000/glass cloth substrate

- Favorable relative dielectric constant and dielectric dissipation factor
- Excellent copper foil adhesion and copper plating coverage inside through -holes
- Favorable solder heat resistance with low linear expansion coefficient in the xy-plane

Item	Unit	Measurement method	EA-2000/glass cloth laminate
Relative dielectric constant	–	ASTM D-150 @ 1 GHz	2.65
Dielectric dissipation factor	–	ASTM D-150 @ 1 GHz	0.002
Copper foil adhesion	kN/m	IPC TM-650 2.4.8	1.46
Copper plating coverage inside TH		Copper plating without desmear or etching	OK
Solder heat resistance	–	Floating measurement at 260°C for 20 seconds	OK
Linear expansion coefficient	ppm/°C	TMA X-Y	10

Transmission loss measurement method by micro-strip line (MSL)

Measurement conditions

- Microstrip line (characteristic impedance 50 Ω, line length 10 mm)
- TRL calibration
- Measuring frequency range: 1 to 40 GHz
- Transmission loss comparison
- The state at zero reflection loss calculated from the measurement results in MSLs with different characteristic impedance will be compared

Evaluation results of microwave transmission characteristics

- The MSL transmission loss of the EA-2000/glass cloth substrate is approximately half that of a competitor's PTFE substrate.
- The transmission loss can be further reduced by improving the laminate composition (glass cloth, low permittivity filler, etc.).

Item	Unit	EA-2000/glass cloth	Competitor's PTFE/glass cloth	FR-4
Relative dielectric constant @ 1 MHz	–	2.65	2.55	4.7
Dielectric dissipation factor @ 1 MHz	–	0.002	0.002	0.02
MSL transmission loss @ 5 GHz	dB/mm	0.00532	0.00903	0.02
MSL transmission loss @ 25 GHz	dB/mm	0.014	0.03	Unmeasurable

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Basic Properties of EA-2000

Item	Unit	Test method	Fluon® EA-2000 (Semi-commercial product)	Fluon® PTFE	Fluon® PFA P-63P
MFR	g/10 minutes	ASTM D3307 (327°C, 49 N)	10–25	–	7–18
Melting point	°C	DSC	300	327	308
Specific gravity		ASTM D792	2.1	2.1–2.2	2.1
Durometer hardness		Shore D	59	55	59
Tensile strength at break	MPa	ASTM D638	36.0	20.6–34.3	40.0
Tensile elongation at break	%	ASTM D638	460	200–400	450
Flexural modulus	MPa	ASTM D790	640	578	560
Izod impact strength (23°C, notched)	J/m	ASTM D256	Non-Break	157	Non-Break
Coefficient of water absorption	%	ASTM D570	<0.03	<0.01	<0.03
Dielectric Constant (1 GHz)		ASTM D150	2.1	2.1	2.1
Dielectric dissipation factor (1 GHz)		ASTM D150	< 0.002	< 0.002	< 0.002
Volume resistance	Ω-cm	ASTM D257	6.5×10^{17}	$>1.0 \times 10^{18}$	$>1.0 \times 10^{17}$
Specific heat	kJ/(kg•K)		1.05	1.05	1.05
MIT folding endurance	cycles	ASTM D2176	8.0×10^3	–	3.4×10^4

HANDLING PRECAUTIONS

All Fluon grades should be stored in clean and dry conditions. No special pre-heating or conditioning is required.

As with most fluoropolymers, care is needed when heating EA-2000 pellets and local exhaust ventilation is required. Please refer to our Safety data sheets (SDS) for guidance.

Thermal decomposition of this product will generate hydrogen fluoride, which is corrosive. Corrosion resistant materials are required for prolonged contact with molten resin.

EA-2000 should be processed at a maximum temperature of 380C in order to preserve the adhesive functionality of the polymer.

Technical information

The information and data stated in this material (and any information and data provided to customers) are based on actual data obtained from reliable sources and should not be considered as guaranteed values for matters not stated in this material. We hereby disclaim any warranties, whether express or implied, regarding this material. The user is responsible for complying with all relevant laws and regulations irrespective of whether stated in this material or not. The provision of this material does not grant a license to any patents, trademarks, or licenses for those products, or any licenses to other intellectual properties.

Handling precautions

The Fluon® products are manufactured and sold for industrial applications. The purchasers are responsible for confirming whether the product quality is appropriate for their applications. The product is not designed for special application such as pharmaceutical or medical use. Not all grades are appropriate for end products or materials for substances that come in contact with food. For the latest information, contact our representatives. Carefully examine how to handle the products stated in this material with reference to our Safety Data Sheet (SDS).

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