



EFI POLYMERS

FORMULATED SOLUTIONS WORLDWIDE

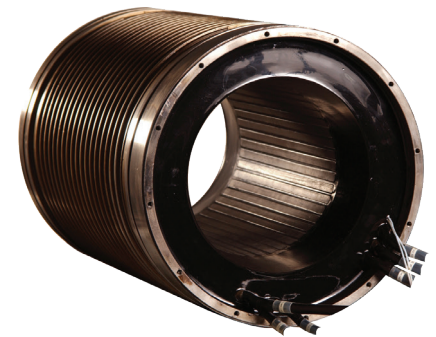
AN INDUSTRY LEADER IN CUSTOM FORMULATIONS

POTTING & ENCAPSULATION RESINS DESIGNED FOR ELECTRICAL MOTORS, TRANSFORMERS AND POWER MANAGEMENT SYSTEMS

For over 25 years, EFI Polymers has been delivering high performance encapsulation materials to the diverse and rapidly evolving Motor, Transformer, & Power Management industries. Our electrically insulating and highly thermally conductive resins greatly reduce temperature rise, withstand extreme thermal shock and high voltage while servicing temperatures up to 250°C.

Our extensive suite of epoxy resin systems is designed specifically for encapsulating motor stators, transformers and coil assemblies for low viscosity, void free & complete penetration of even the finest AWG/IEC magnet wire. These advanced formulas provide long term protection from elements such as, vibration, water ingress, oils, chemicals, condensation, vapors, harsh environments and wash-down duty applications.

EFI Polymers has vertically integrated over 40 different UL 1446 recognized potting & encapsulation systems optimized for virtually every type of motor, transformer, solenoid or other coil assembly.



Complete Penetration of Magnet Wire

INDUSTRIES

- E-Mobility & Electric Vehicles
- Charging Stations
- Transformers, Inverters, Power Conditioning & Switching
- Automation, Motion Control & Industrial Packaging
- Automotive, Aerospace, Railway
- Food & Beverage

RECORD OF EXCELLENCE

The world's leading motor manufacturers process our systems to encapsulate tens of thousands of stators every day, all over the globe. These materials provide outstanding durability and long term performance at a very cost-effective price.

UL 1446 RECOGNIZED FILE NUMBER E210549

We have an extensive insulation system file with UL, and many of our customers have used this to leverage cost savings in other materials, such as lead wire, interwinding and ground insulation, tapes, and other motor assembly products. End users can adopt these UL Insulation Systems at no additional charge.



EFI Resin	20206				20346				20290				20317			
EFI Hardener	50013	50021	50146	50148	50013	50021	50146	50148	50013	50021	50146	50148	50013	50021	50146	50148
UL 1446 Insulation Class	Class H 180°C								Class H 180°C							
EFI Polymers UL File E210549																
Color Mixed	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Viscosity, cps @ 25 °C																
a.) Resin @ RT	80,000	80,000	80,000	80,000	70,000	70,000	70,000	70,000	80,000	80,000	80,000	80,000	70,000	70,000	70,000	70,000
c.) Resin @ 49°C	5,500	5,500	5,500	5,500	4,500	4,500	4,500	4,500	14,000	14,000	14,000	14,000	19,000	19,000	19,000	19,000
f.) Hardener	10	20	200	70	10	20	200	70	10	20	200	70	10	20	200	70
Mixed Viscosity, cps @ 50°C	750	1,000	700	4,500	700	850	500	2,800	500	450	650	2,200	1,800	1,850	1,000	4,500
Mixed Viscosity, cps @ 60°C				3,500				1,350				1,600				3,300
Mixed Density lbs/gal	12.2	12.1	11.6	12.5	12.4	12.4	11.9	12.8	13.8	13.8	12.9	14.2	14	13.9	13.2	14.3
Mix Ratio, Parts Resin to Hardener																
a.) By Weight	100 to 16	100 to 17	100 to 51.5	100 to 12.5	100 to 14	100 to 14.8	100 to 44.5	100 to 10.7	100 to 11.8	100 to 12.4	100 to 37.3	100 to 9	100 to 9.1	100 to 9.6	100 to 29	100 to 7
b.) By Volume	3.7 to 1	3.5 to 1	1.3 to 1	5 to 1	4.2 to 1	4 to 1	1.5 to 1	5.8 to 1	4.4 to 1	4.3 to 1	1.7 to 1	6.2 to 1	5.8 to 1	5.6 to 1	2.1 to 1	8 to 1
Thermal Conductivity, W/m-K (Theoretical)	0.38	0.37	0.28	0.4	0.4	0.4	0.3	0.43	0.67	0.66	0.46	0.73	0.73	0.72	0.52	0.79
Gel Time, Minutes																
b.) 200g Resin @ 49°C	295	70			346	65			463	133			421	130		
g.) 200g @ 90°C			80-110				70-100				80-110				100-130	
H.) 200g @ 121°C				30-50				30-45				40-55				40-75
Hardness, Shore D	85	85	90	92	85	85	90	89	85	85	91	96	85	85	90	85
Tg, °C	90	88	119	146	87	83	118	133	68	55	94	110	50	48	86	84
CTE, (µm/m·°C)																
a.) below Tg	47	43	56	45	48	46	50	44	31	35	45	30	33	53	51	51
b.) above Tg	164	162	173	152	158	158	153	150	132	133	147	125	131	148	135	136
Thermal Cycle, -40°C to 150°C	good	good	(good)	(good)	very good	very good	very good	very good	good	good	(good)	(good)	excellent	excellent	excellent	excellent
Cure Schedule (Gel/Cure), hrs																
a.) RT/105°C	24/3	24/3			24/3	24/3			24/3	24/3			24/3	24/3		
b.) 90°C/150°C			2/3				2/3				2/3				2/3	
c.) 121°C/150°C				1/3				1/3				1/3				1.5/3
Shelf Life, Months	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Dielectric Constant																
a.) 100 Hz	4.5	4.6	3.73	4.8	4.3	4.4	3.5	4.5	4.5	4.7	3.9	4.6	4.2	4.4	3.6	4.3
b.) 1 kHz	4.4	4.5	3.68	4.7	4.2	4.2	3.5	4.4	4.4	4.5	3.9	4.6	4.1	4.2	3.6	4.2
c.) 10 kHz	4.3	4.4	3.62	4.6	4.1	4.2	3.4	4.3	4.4	4.4	3.9	4.5	4.0	4.2	3.6	4.2
d.) 100 kHz	4.1	4.2	3.56	4.4	4.0	4.0	3.4	4.1	4.3	4.3	3.8	4.4	4.0	4.1	3.5	4.1
e.) 1 MHz	3.9	4.0	3.48	4.2	3.9	3.9	3.3	4.0	4.1	4.1	3.8	4.3	3.9	4.0	3.5	4.0
Dissipation Factor																
a.) 100 Hz	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.01	0.01	0.02	0.03	0.01	0.01
b.) 1 kHz	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.03	0.01	0.01	0.02	0.02	0.01	0.01
c.) 10 kHz	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
d.) 100 kHz	0.03	0.03	0.01	0.03	0.02	0.02	0.01	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01
e.) 1 MHz	0.03	0.03	0.02	0.03	0.02	0.02	0.01	0.03	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Resistivity																
a.) Insulation Resistance, ohms	9.20E+13	3.86E+13	8.88E+13	2.69E+13	3.93E+13	3.23E+13	5.31E+13	5.66E+13	1.07E+14	1.76E+13	3.05E+14	1.73E+15	6.31E+13	2.70E+13	1.43E+14	1.06E+13
b.) Volume Resistivity, ohm-cm	6.71E+15	2.01E+15	6.19E+15	1.73E+15	2.17E+15	2.39E+15	3.53E+15	3.15E+15	6.99E+15	1.26E+15	1.91E+16	5.45E+15	3.88E+15	1.91E+15	8.88E+15	6.46E+15
c.) Surface Resistivity, ohms	1.42E+16	3.00E+16	1.77E+16	8.60E+15	5.50E+15	2.18E+15	7.43E+15	8.87E+15	6.24E+15	1.00E+16	3.59E+16	1.35E+17	1.42E+16	1.36E+16	1.05E+16	2.18E+16