



THE GUND COMPANY

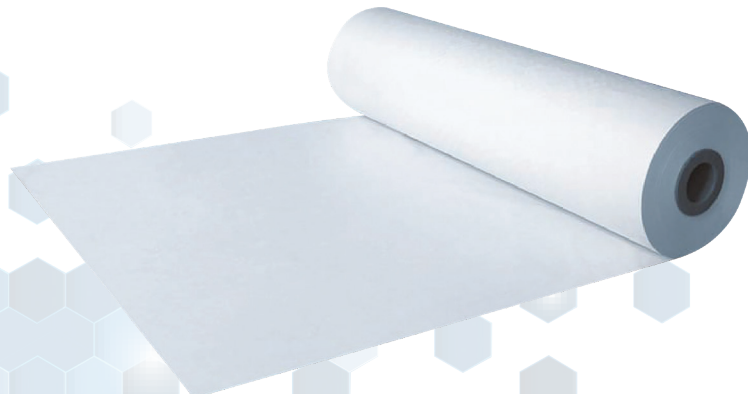
MANUFACTURERS & FABRICATORS OF ENGINEERED MATERIAL SOLUTIONS



G-FLEX™ EV Series

Item:	G-Flex™ EV Series			
Description:	G-Flex™ EV is an aramid-coated polyethylene separator film used to improve battery performance by increasing charging speed and extending cycle life, while reducing risk of a thermal runaway. Often used in electric vehicle and other battery storage applications, G-Flex™ EV offers improved wettability, low areal density, high-puncture resistance, and superior dielectric and thermal insulation properties. This separator film comes in a variety of thicknesses and coatings suitable for cylindrical, prismatic, and pouch cell configurations.			
Availability:	Material Format:	Thickness:	Film [µm] 5.0 - 16.0	Coating (per side) [µm] 0.5 - 4.0
		Coating Options:	EV120 - Meta-aramid Coating EV220 - Ceramic & Meta-aramid Coating EV320 - Ceramic & Para-aramid Coating <i>EV(ABC-D): A = Style; B = # Coated sides; C = Coating Thickness, D = PE Thickness</i>	
	Color:	Stark White		

Key Characteristics:		Units	PE (7mil)	EV122-7	EV222-7	EV322-7
Thickness		µm	7.2	11.3	11.5	11.8
Density		g/m ²	4.1	6.8	7.4	7.8
Air Permeability		s/100ml	112.4	172.1	165.2	180.6
Puncture Strength		N	3.5	4.3	4.2	4.2
Tensile Strength (Mechanical Direction)		MPa	244.9	198.5	190.5	180.4
Tensile Strength (Tensile Direction)		MPa	287.9	215.9	210.6	200.7
Melting Temperature TMA		°C	135-140	220-260	200-220	350-400
Heat Shrinkage	105°C Mechanical Direction	%	2	0.2	0	0
	105°C Tensile Direction	%	2	0	0.0009	0
	180°C Mechanical Direction	%	N/A	5.2	5	4.5
	180°C Tensile Direction	%	N/A	4.8	3.5	2.3





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Thermal Properties

- G-Flex EV series is designed for high-temperature environments. The melting temperature of G-Flex film configurations exceed the melting temperature of Ceramic-Coated Separator (CCS) films.
- G-Flex EV300 series exhibits both a higher melting temperature and lower shrink percentage

Shrink Rate	G-Flex EV				
	PE	CCS	EV113-9	EV213-9	EV313-9
Separator	PE	CCS	EV113-9	EV213-9	EV313-9
Thickness (µm)	12	12 (3+9)	12 (3+9)	12 (3+9)	12 (3+9)
105°C Shrink Rate (%)	2.00%	0.00%	0.20%	0.00%	0.00%
130°C Shrink Rate (%)	N/A	2.50%	3.00%	2.15%	1.50%
180°C Shrink Rate (%)	N/A	3.25%	4.80%	3.50%	2.30%
Melting Temperature	130° - 150°	153° - 170°	220° - 260°	200° - 220°	350° - 400°

Wettability

- Increasing electrolyte absorption is critical to improving the efficiency of a battery. The contact angle of G-Flex EV is 50% of PE resulting in improved surface adhesion of the electrolyte. It also exhibits a faster absorption rate and higher retention rate than CCS films.

Wettability by Surface Area

Separator	CCS	EV122-9	EV222-9	EV322-9
Thickness (µm)	13 (2+9+2)	13 (2+9+2)	13 (2+9+2)	13 (2+9+2)
Test Conditions	15mm wide separator, one end (2mm) dipped in electrolyte for 10 minutes			
Absorbancy, length (mm)	4.5	10.5	13	9.5
Absorbancy, speed (mm x min ⁻¹)	0.45	1.05	1.3	0.95



Wettability by Weight

Separator	PE		CCS		EV100	
	1	2	1	2	1	2
Sample	1	2	1	2	1	2
Weight before soaking (g)	0.054	0.053	0.0977	0.0988	0.0773	0.072
Weight after soaking (g)	0.094	0.0936	0.01614	0.1637	0.1869	0.1827
Absorption (g)	0.04	0.041	0.0637	0.0649	0.1096	0.1107

Electrical Performance

The effect of improved wettability and physical endurance of G-Flex EV results in a longer-lasting and more efficient battery.

Results of an NMC-811 10Ah battery system using G-Flex EV compared to CCS:

- 11% higher low-temp discharge capacity
- 5% cycle life improvement
- Increased high-rate discharge capacity

Separator	DCR/mΩ	Room Temp, Discharge			Room Temp, Charge			20°C Discharge	55°C, Discharge		
		1C	2C	3C	1C	2C	3C	1C	1C	2C	3C
CCS	8.085	100.00%	99.01%	97.34%	100.00%	88.46%	82.35%	28.64%	106.16%	104.12%	103.11%
EV122-7	8.149	100.00%	98.94%	96.83%	100.00%	90.25%	84.65%	29.31%	107.54%	105.77%	104.49%
EV321-9	8.495	100.00%	97.87%	94.18%	100.00%	94.03%	89.43%	40.18%	109.45%	108.92%	106.70%

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