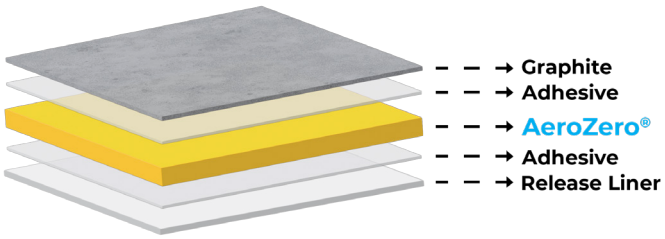
AeroZero® Thermal Protection Systems

AZ-TPS Graphite Product Portfolio

Product Description

The AZ-TPS Graphite portfolio consists of a range of products that include a 165 micron (6.5 mil) AeroZero® polyimide aerogel film with an external graphite film joined and an adhesive bonding layer. The adhesive is a pressure sensitive adhesive (PSA) with a release layer that is peeled off before application to a substrate. Potential substrates include stainless steel, aluminum, glass, carbon fiber, and polymer substrates such as polyimides, polyether ketones, polyurethanes, and polyesters. Typical use is thermal barrier/protection of parts in the Aerospace, Defense and Electronic industries.



Pictured: AZ-TPS GR 100

Application

Prior to peeling the release liner from the adhesive, ensure the substrate is clean and free of loose particles. Standard application temperature is 25 °C (77 °F) and the recommended set time for optimal adhesion is three days prior to testing. The minimum application temperature is 10 °C (50 °F) and minimum set time is 24 hours before performing any tests. Increasing temperature and dwell time may increase adhesion strength.

Features

- Ultra-thin thermal protection system (TPS)
- Excellent thermal insulator and heat spreader
- Lightweight
- Easy application with permanent bonding
- Flame retardant
- High heat resistance > 1000 °F (538 °C)

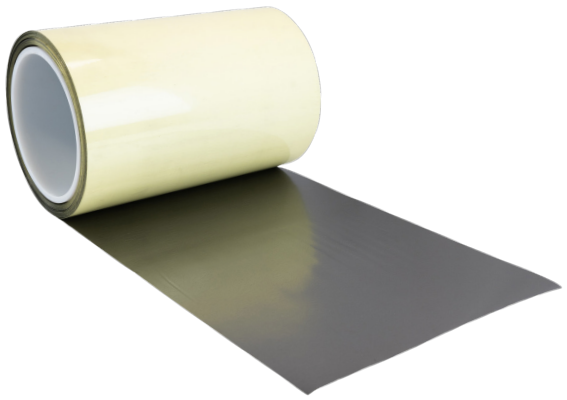
Standard Dimensions

- Test Sample: 216 x 280 mm (8.5 x 11 in)
- Sample Roll: 304 mm x 3.05 m (1 x 10 ft)
- Standard Roll: 304 mm x 30.5 m (1 x 100 ft)

Storage

Recommended Storage Conditions:

- Temperature: below 25 °C (77 °F)
- Relative Humidity: below 50%



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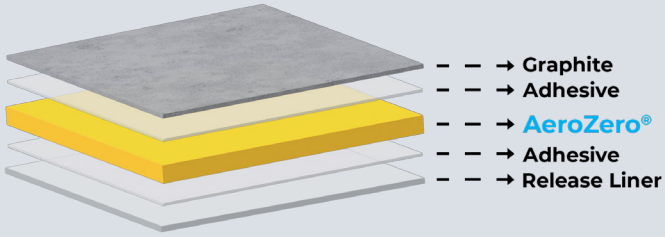
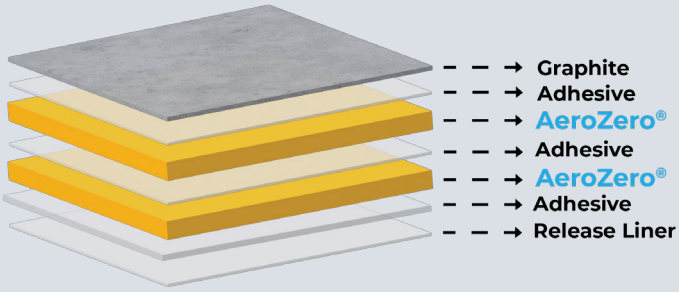
AeroZero® Thermal Protection Systems

AZ-TPS GR Product Portfolio

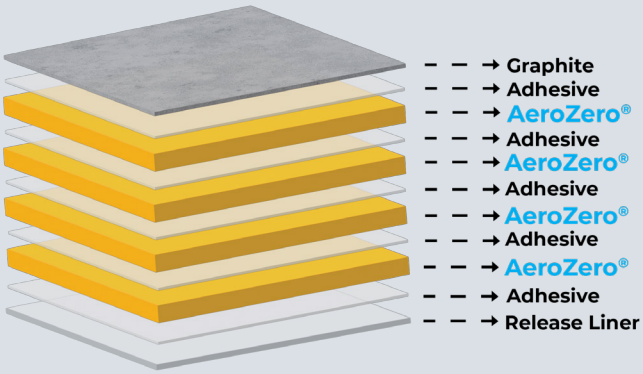
Section 1
AeroZero TPS Graphite



Section 2
DualZero TPS Graphite



Section 3
QuadZero TPS Graphite



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Section 1:
AeroZero TPS
Graphite

AeroZero® Thermal Protection Systems

AZ-TPS GR 100 Data

Physical and Mechanical Properties	Method	Value
Product Code	-	2020-11S1-000
Thickness, µm (mil)	ASTM D374	267 (10.5)
Tensile Strength, MPa (ksi)	ASTM D882	4.5 (0.65)
Young's Modulus, MPa (ksi)	ASTM D882	415 (60)
Tensile Elongation at Break, %	ASTM D882	4
Density, g/cm^3	ASTM D202	0.70

Thermal Properties	Method	Value
Thermal Conductivity (25 °C), W/m•K	ASTM C518	0.053
Specific Heat Capacity (25 °C), J/g•°C	ASTM C1784	1.07
IR Emissivity (Graphite Surface)	ASTM E408	0.29

Thermomechanical Properties	Method	Value
Glass Transition Temp (AZ T_g, DMA), °C (°F)	ASTM E1640	305 (580)
Decomposition Temp (10 wt% loss, TGA), °C (°F)	ASTM 2550	470 (878)

Additional Properties	Method	Value
Adhesive Strength: 180 °peel/3 day-RT dwell time AZ film on 50.8 micron (2 mil) AI Foil, N/m (Lbf/in)	ASTM D3330	>300 (1.7)
UL Flammability Rating	UL94 VTM0	TM-0
Adhesive Type	-	Silicone

Data within this table are typical values for the graphite TPS product family.
Product Code # 2020-11S1-000

AZ-TPS GR 100

- Graphite: 50.8 micron (2 mil)
- Silicone Adhesive (PSA): 25.4 micron (1 mil)
- AeroZero (AZ): 165 micron (6.5 mil)
- Silicone Adhesive (PSA): 25.4 micron (1 mil)

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Section 2:
DualZero TPS Graphite

AeroZero® Thermal Protection Systems

DualZero TPS Graphite 201 Data

Physical and Mechanical Properties	Method	Value
Product Code	-	2020-U4S1-000
Thickness, µm (mil)	ASTM D374	483 (19.0)
Tensile Strength, MPa (ksi)	ASTM D882	6.7 (0.9)
Young's Modulus, MPa (ksi)	ASTM D882	460 (66.7)
Tensile Elongation at Break, %	ASTM D882	6.7
Density, g/cm^3	ASTM D202	0.65

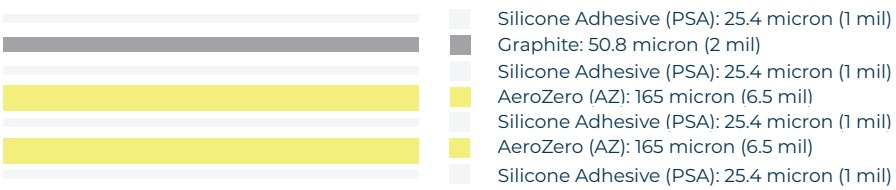
Thermal Properties	Method	Value
Thermal Conductivity (25 °C), W/m•K	ASTM C518	0.045
IR Emissivity (Graphite Surface)	ASTM E408	0.29
Specific Heat Capacity, (25 °C), J/g• °C	ASTM C1784	1.03

Thermomechanical Properties	Method	Value
Glass Transition Temp (AZ T_g, DMA), °C (°F)	ASTM E1640	305 (580)
Decomposition Temp (10 wt% loss, TGA), °C (°F)	ASTM 2550	410 (770)

Additional Properties	Method	Value
Adhesive Strength AZ Side: 180 °peel/3 day-RT dwell time AZ film on 50.8 micron (2 mil) Al Foil, N/m (Lbf/in)	ASTM D3330	>380 (2.1)
UL Flammability Rating	UL94 V-0	V-0
Adhesive Type	-	Silicone

Data within this table are typical values for the graphite TPS product family
Product Code #2020-U4S1-000

DualZero TPS GR 201



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Section 3:
QuadZero TPS Graphite

AeroZero® Thermal Protection Systems

QuadZero TPS GR 400 Data

Physical and Mechanical Properties	Method	Value
Product Code	-	2020-N4S1-000
Thickness, µm (mil)	Thickness, µm (mil)	838 (33)
Tensile Strength, MPa (ksi)	Tensile Strength, MPa (ksi)	7.5 (1.1)
Young's Modulus, MPa (ksi)	Young's Modulus, MPa (ksi)	300 (44)
Tensile Elongation at Break, %	Tensile Elongation at Break, %	7
Density, g/cm^3	Density, g/cm^3	0.55
Aerial Density, g/cm^2	Aerial Density, g/cm^2	425

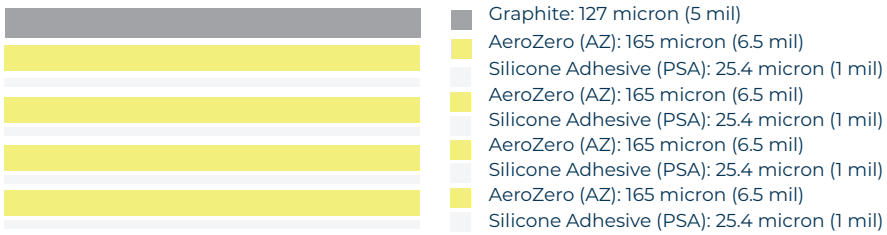
Thermal Properties	Method	Value
Thermal Conductivity (25 °C), W/mK	Thermal Conductivity (25 °C), W/mK	0.044

Thermomechanical Properties	Method	Value
Glass Transition Temperature (AeroZero Tg, DMA), °C (°F)	Glass Transition Temperature	305 (580)
Decomposition Temperature (10 wt% loss, TGA), °C (°F)	Decomposition Temperature	425 (797)

Additional Properties	Method	Value
UL Flammability Rating	UL Flammability Rating	V-0
Flammability	60 Sec Vertical Burn	Complies
Adhesive Type	-	Silicone

Data within this table are typical values for the standard QZ GR product family.
Product Code # 2020-N4S1-000

QuadZero TPS GR 400



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