



METALIGHTEST MATERIALS

Let's Make the Products Better Together



工業技術研究院

Industrial Technology
Research Institute

Functional Lightweight Composite Material Solutions for Drones

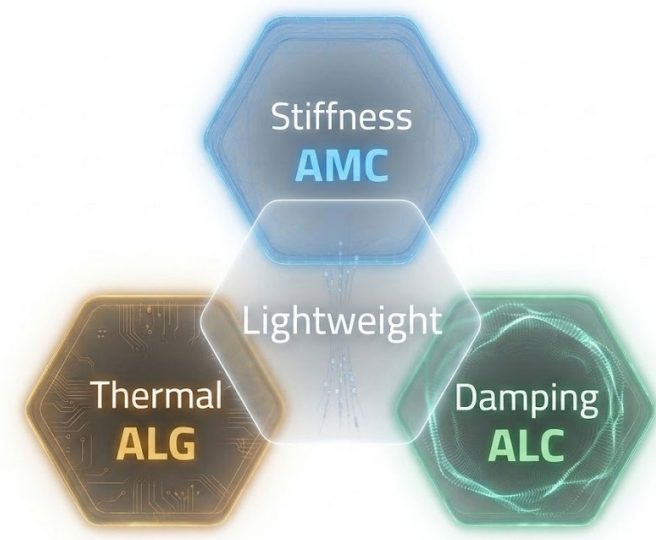
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About Metalightest Materials



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Let's Make the Products Better Together



Manufacture **lightweight** functional materials



Incorporate **simulation and AI-driven data analysis** to optimize performances



Customize lightweight functional material solutions based on product needs



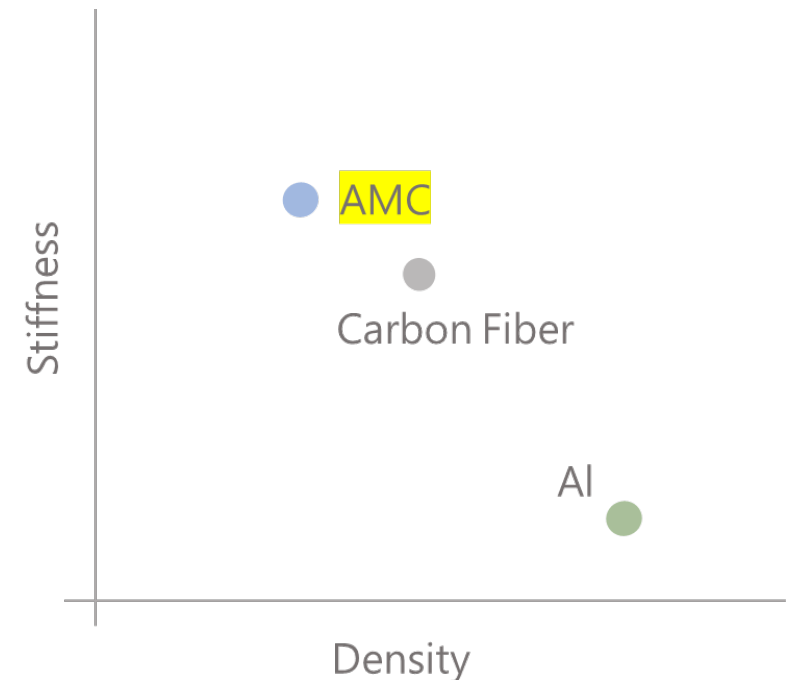
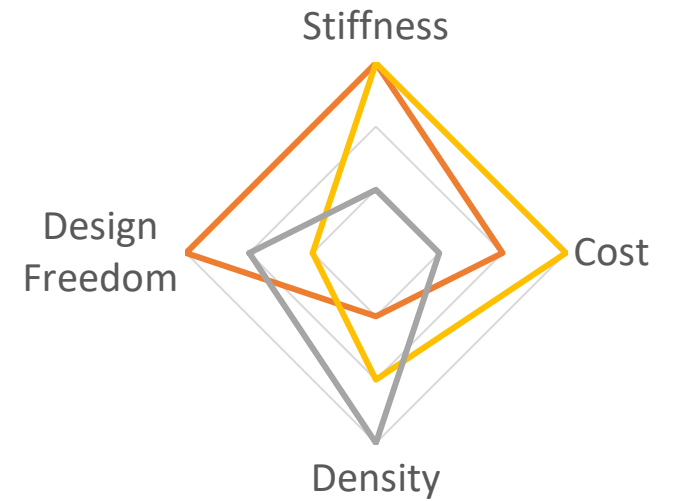
AMC

Additive Manufactured Carbon Fiber Composite

	AMC
Thickness (mm)	0.3 ↑
Density (g/cm ³)	1.2
Flexural Modulus (GPa)	30
Flexural Strength (MPa)	455
Ductility (%)	1.5

- Low density, high modulus combined with high design freedom optimizes the stiffness-to-weight ratio.
- Starting with the optimization of carbon fiber raw materials, the strength of high-strength carbon fiber yarn is higher than that of typical carbon fiber yarns on the market. (~6.5% higher modulus than Toray T300)

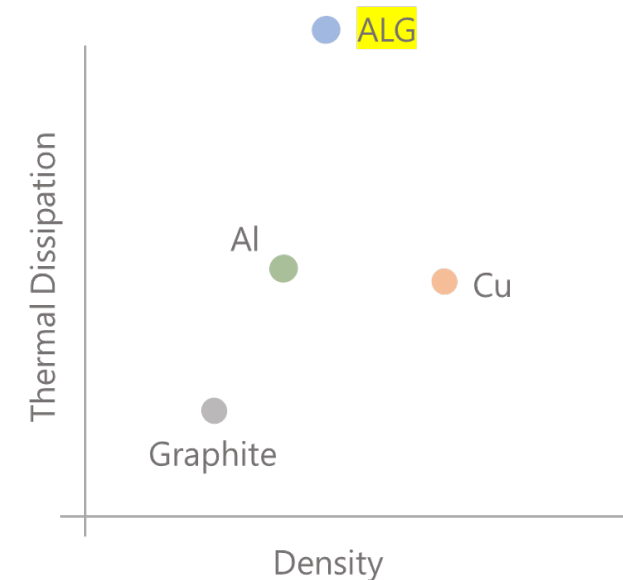
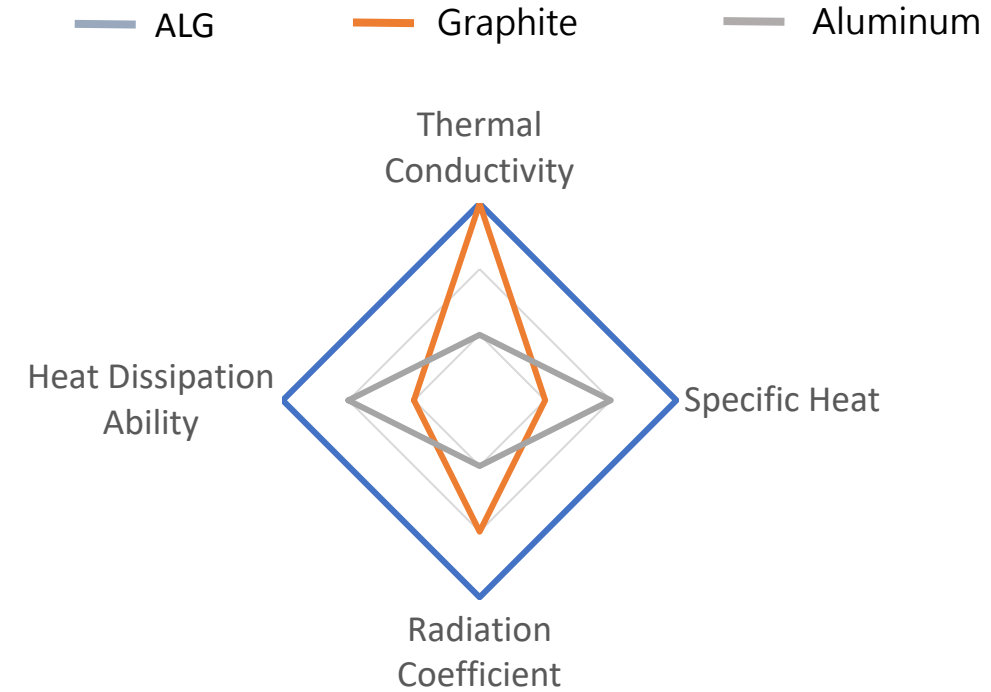
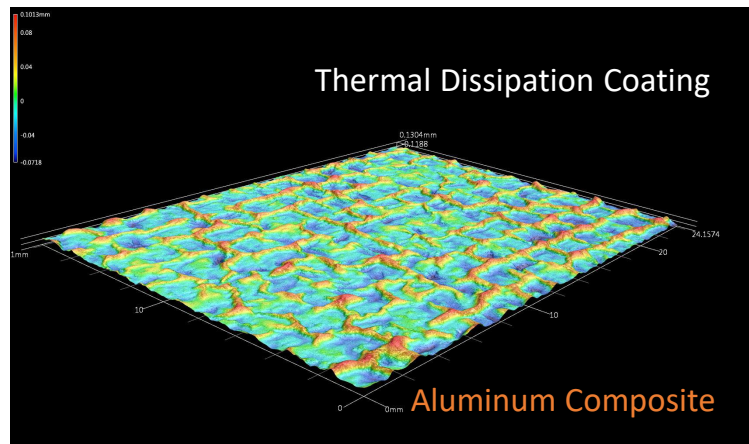
— AMC — Carbon Fiber — Aluminum



ALG Thermal Dissipation Sheet

	ALG
Thickness (mm)	0.1 ↑
Thermal Conductivity (W/m-K)	230-1500
Specific Heat (J/g-K)	1.4-1.6
Radiation Coefficient	0.7

ALG combines high heat capacity, radiation coefficient, and excellent thermal conductivity to effectively address overheating issues in electronic components, which enhances product performance and stability.

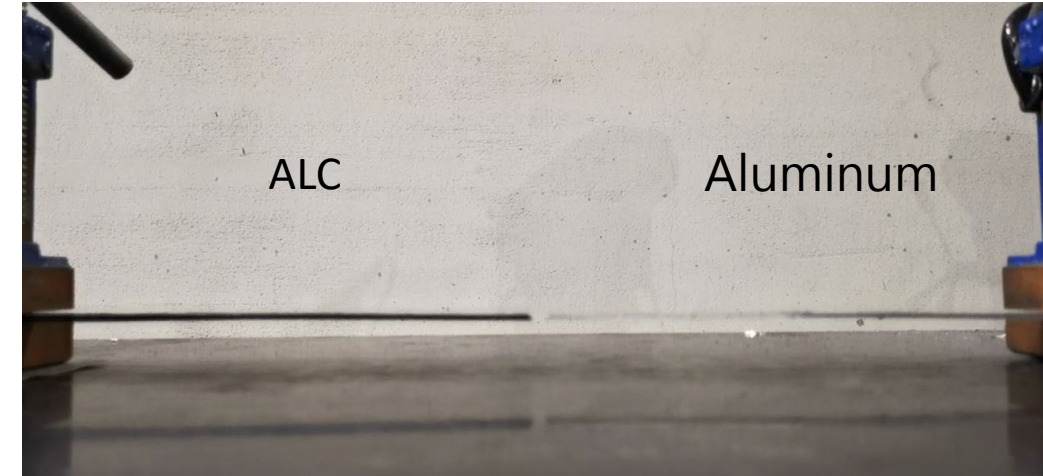


ALC

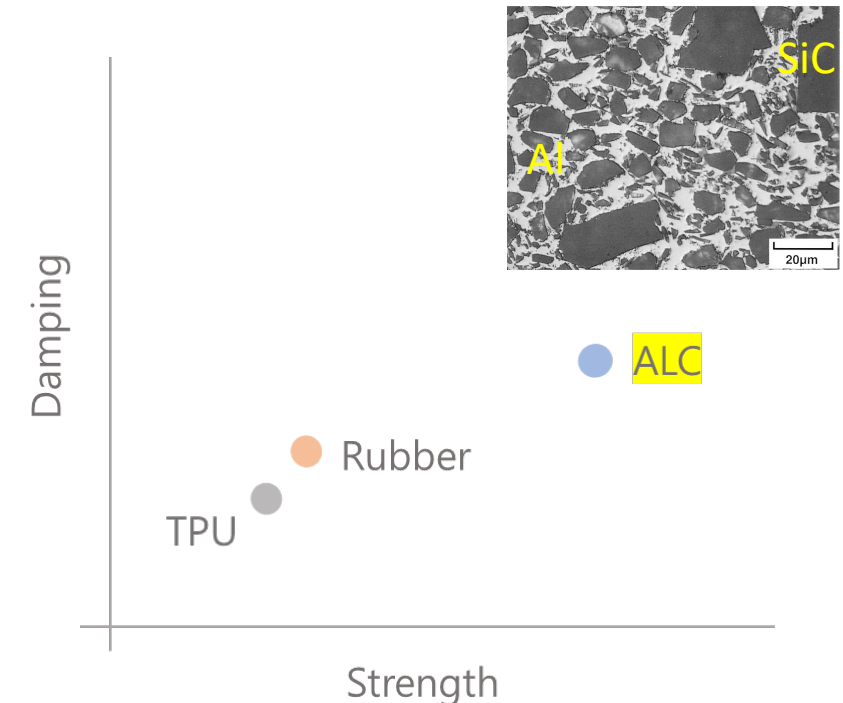
Aluminum Matrix composite

ALC

Thickness (mm)	0.85 ↑
Density (g/cm ³)	3.5
Flexural Modulus (GPa)	110
Yield Strength (MPa)	450
Flexural Strength (MPa)	560
Ductility (%)	5
Loss Tangent	0.03



- ALC is an aluminum-ceramic composite material that offers superior mechanical strength and vibration resistance.
- Soft materials were chosen for their vibration resistance, but such materials could not be used as part of the structures.
- ALC provides the unique solution for simultaneously increasing rigidity and vibration resistance.



Drone Applications



ALC Damping Washer

- ⚙ Improve flight efficiency
- ⚙ Improve gyroscope performance

ALG Thermal Sheet/Fin

- ⚙ Improve ESC duration
- ⚙ Improve motor efficiency

AMC Frame

- ⚙ Improve flight time
- ⚙ Quieter



AMC Applications in Drones

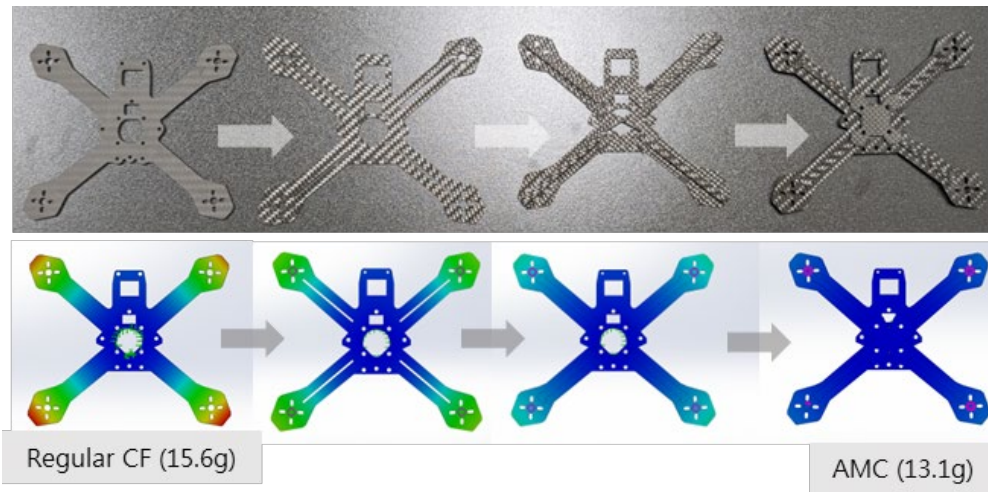


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Frame



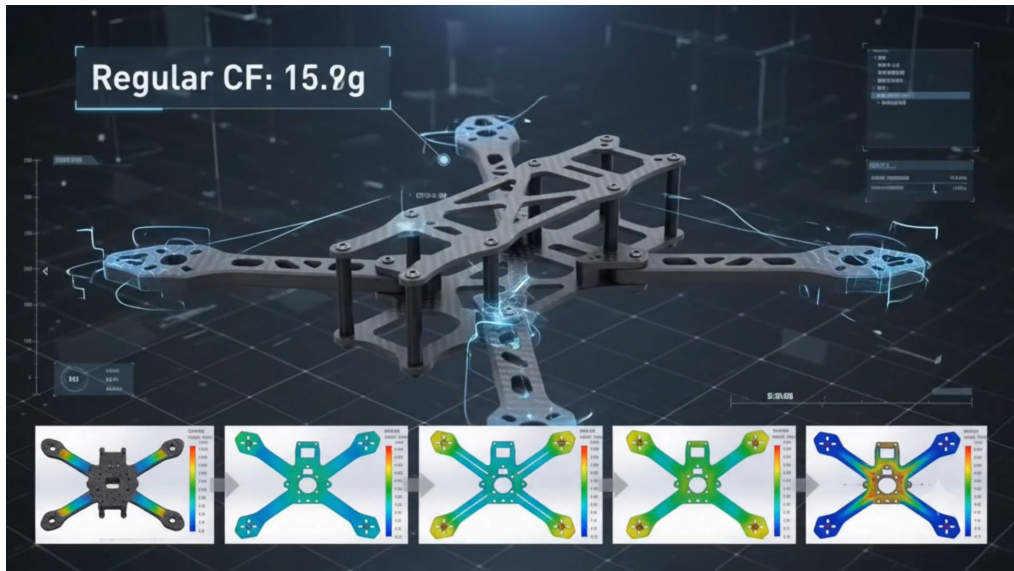
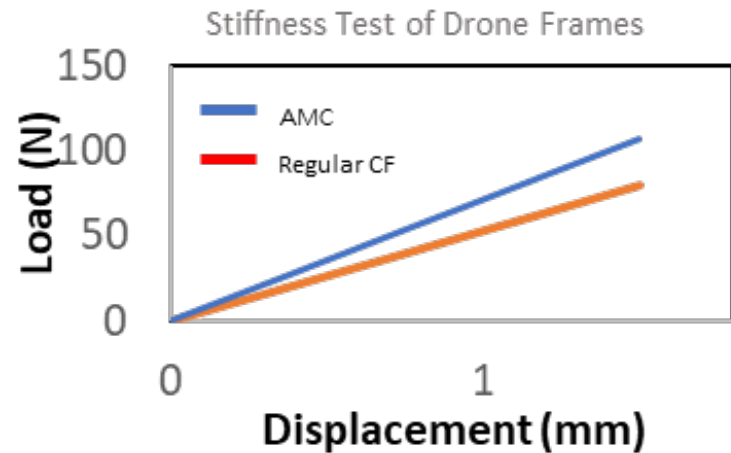
AMC offers a high degree of design freedom and enhances the stiffness-to-weight ratio of drone frames beyond regular carbon fiber frames.



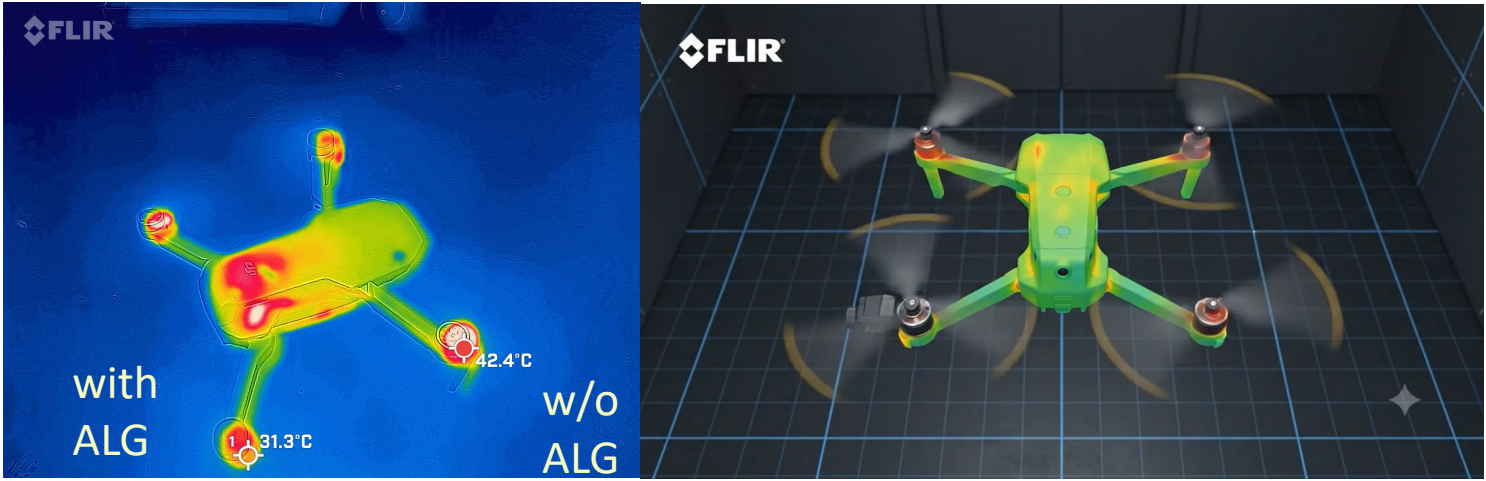
Internal Structure



In fixed wing drones, AMC can be used as ultra-light internal structure.



ALG Applications in Drones



Efficiency of motors improves as the temperature decreases.

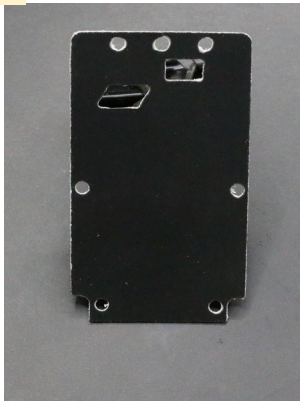


The ESC regulates power between the battery and the motor.

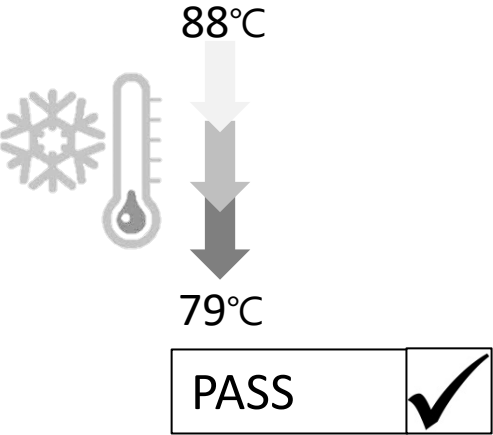


Excessive current can lead to an ESC overheating (optimal temp is below 80°C).

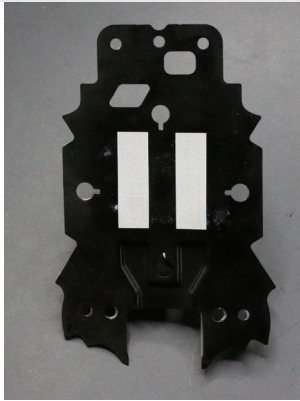
ALG



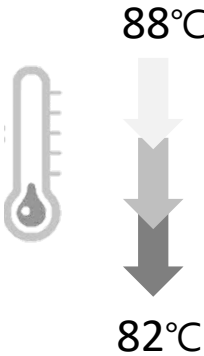
Weight 1.71g
Dimensions 40*70*0.3mm



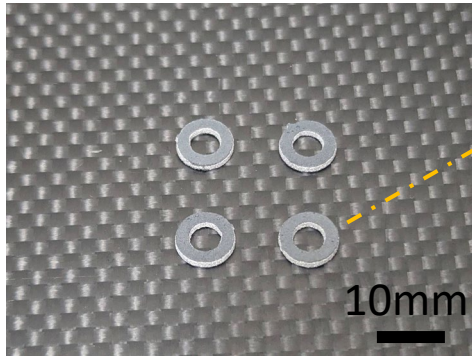
Stock Thermal Sheet



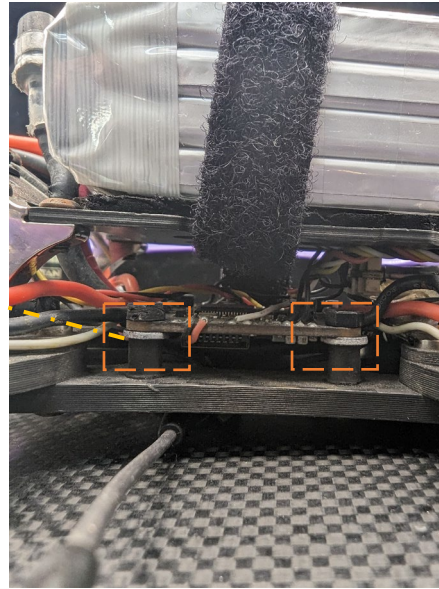
Weight 1.77g
Dimensions 50*80*0.4mm



ALC Application in Drones



ALC washer



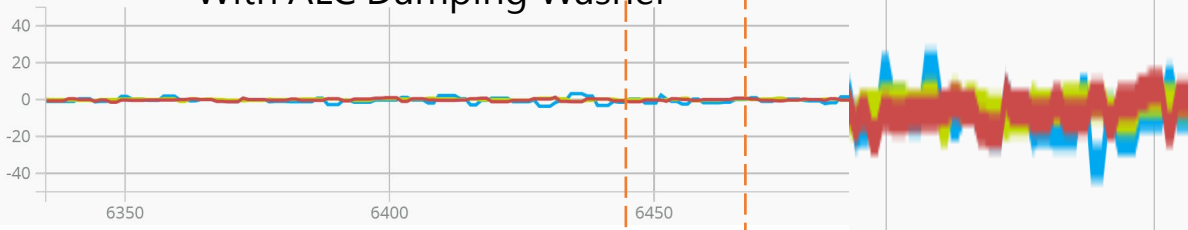
- Vibrations generated by high-speed props can disrupt the gyroscope's operation.
- Reducing vibration interference by ALC enhances drone maneuverability and endurance.
- Installing ALC damping washers on the gimbal allows for more accurate results under the same shooting conditions.

X
Y
Z

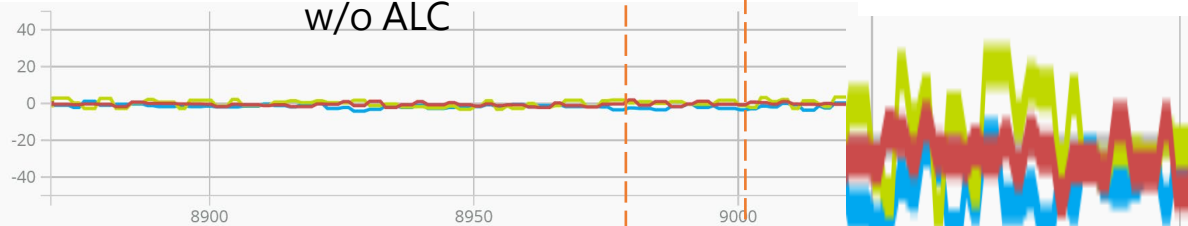
Drone Gyroscope Testing for Blade Vibration

Zoom In

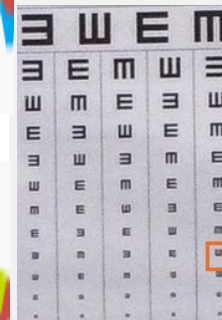
With ALC Damping Washer



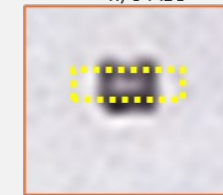
w/o ALC



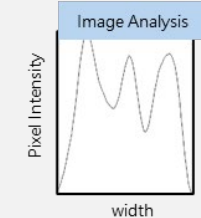
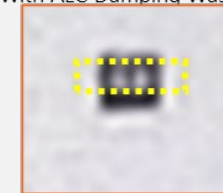
30m



w/o ALC



With ALC Damping Washers



Actual Appearance



Why You Need **Our Solutions**



In the **AIoT era**, the performance of mechanical equipment is significantly enhanced by AI control: every gram reduced, every degree of temperature lowered, and every vibration minimized directly boost the overall performance of the equipment.

The technology of **Metalightest Materials** has opened numerous opportunities in the AIoT era, enabling enterprises to optimize intelligent automation equipment through material solutions.





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Robot Applications

AMC Shell



Protect electronic component

AMC Mechanical Components



Improve duration



Improve precision

ALC Damping Washer



Improve Lidar performance

ALG Thermal Sheet



Improve the duration of electronic components



Improve motor efficiency



AMC Applications in Robots

Shell



AMC offers a high strength-to-weight ratio to protect delicate components in a severe environment.

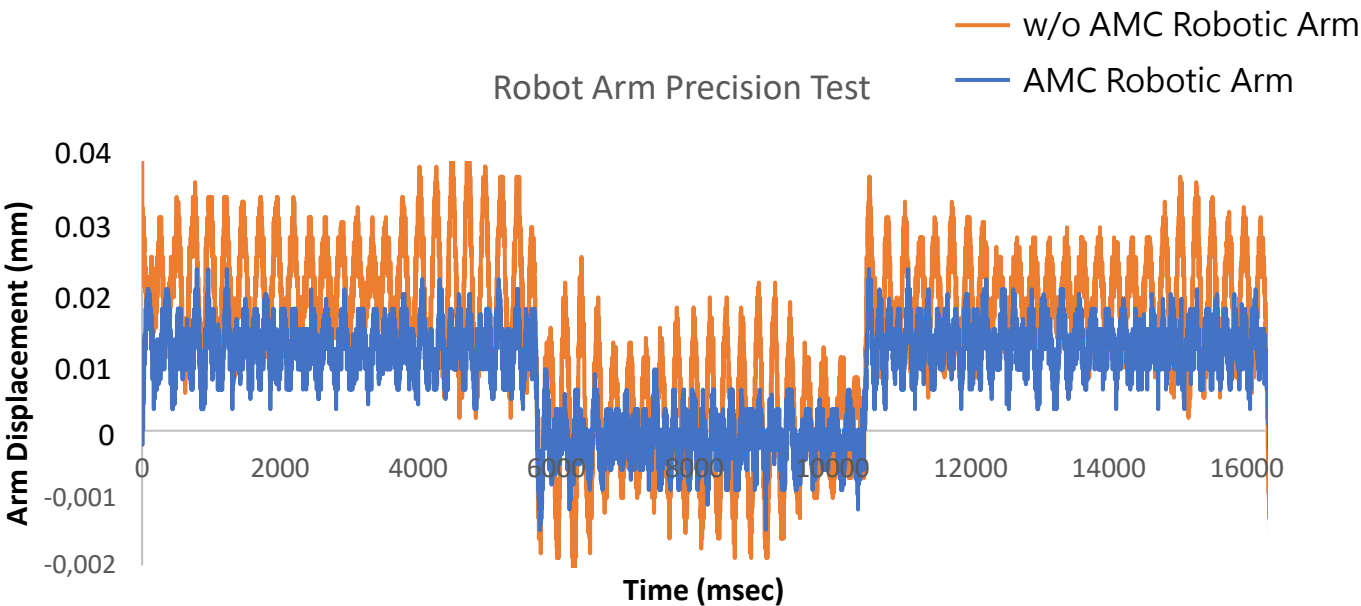
Mechanical Components



Robotic arm precision comprises positioning and repeatability. Despite model or sensor-based compensation, errors remain inevitable in complex tasks.



AMC balances high rigidity with a lightweight design, reducing motion inertia while preserving positioning accuracy.



ALG Applications in Robots

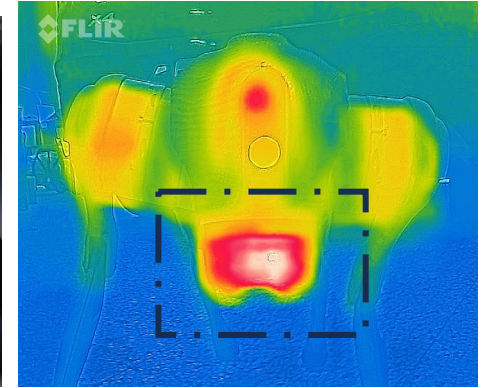


Better cooling equals higher precision and longer reliability for mechanical rotating LiDAR.

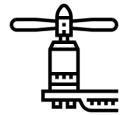
Ensures Accuracy: Prevents laser wavelength drift and maintains precise optical alignment.

Boosts Sensitivity: Reduces thermal noise in sensors for better long-range detection.

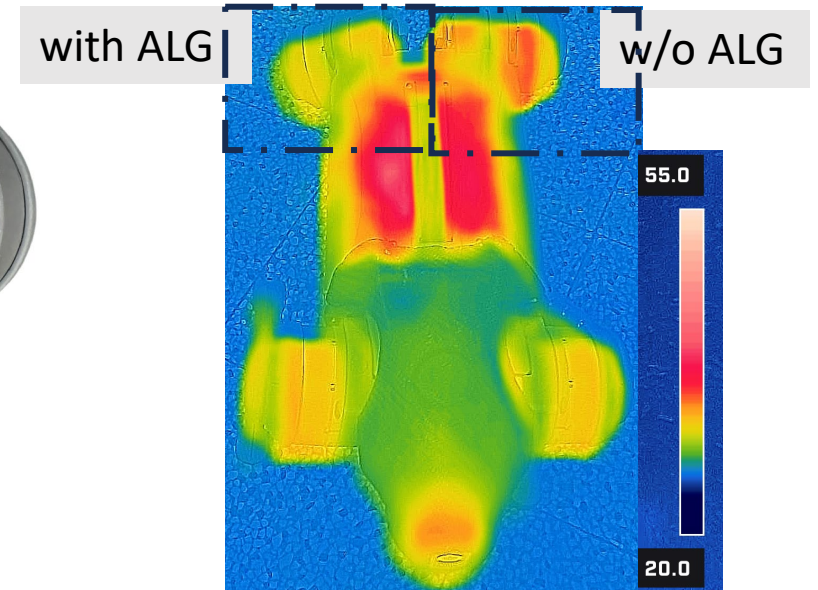
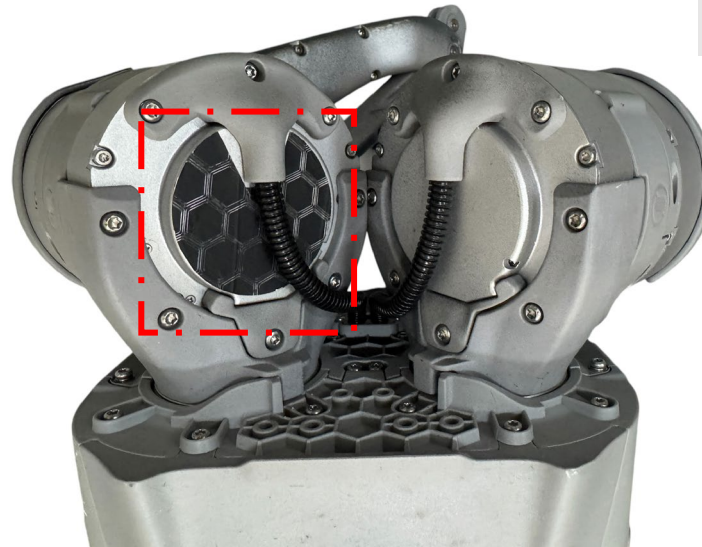
Maintains Speed: Prevents processor throttling to ensure real-time data output.



ALG Reduces the Temperature of Servo Motors



ALG uses a lightweight and slim approach to facilitate motor cooling, thus enhances the motor's torque output and efficiency.



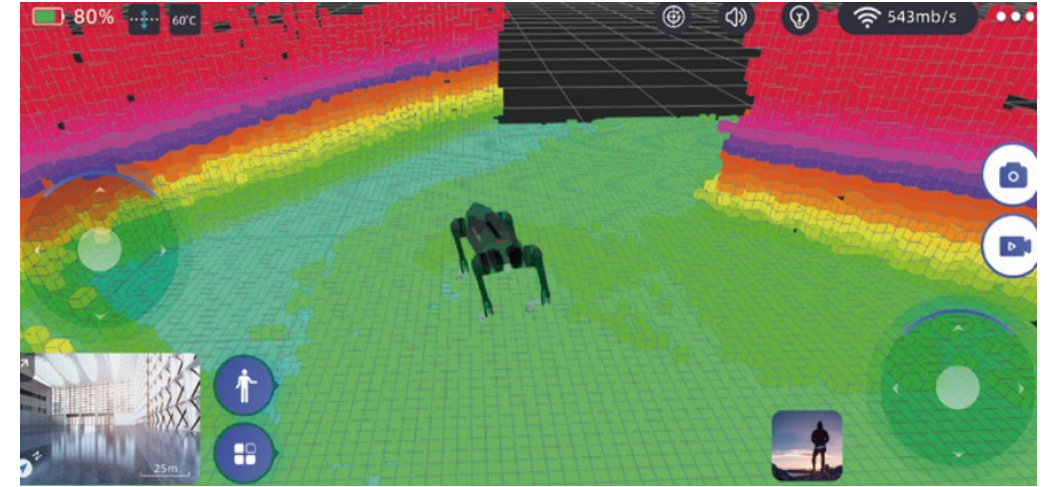
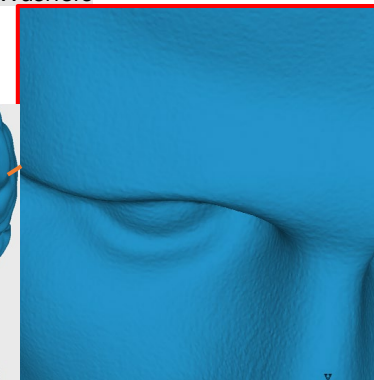
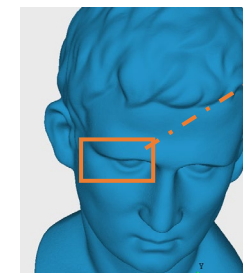
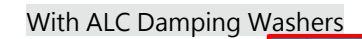
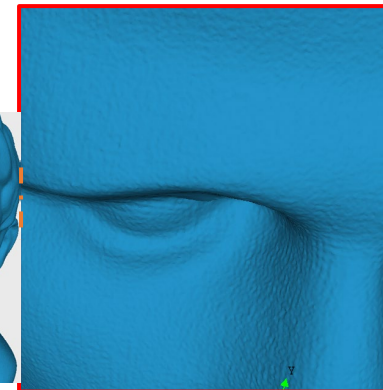
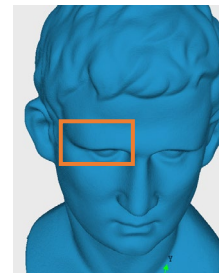
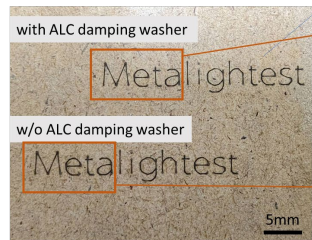
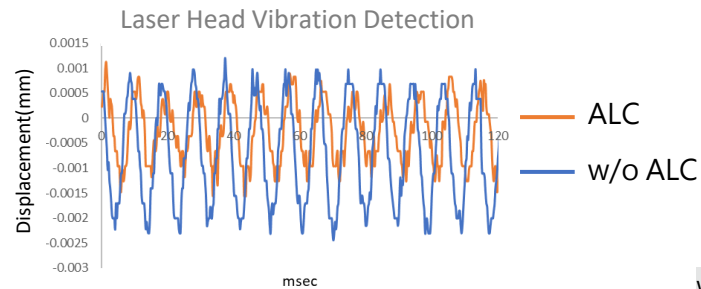
ALC Applications in Robots

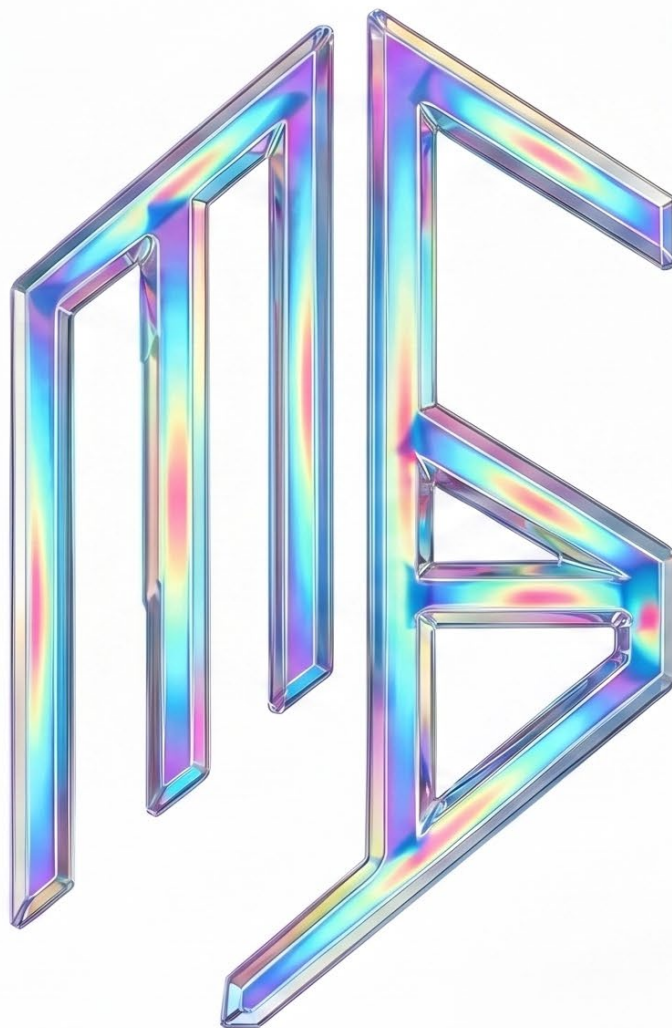


The vibrations generated by the servo motors and fans within the robot can compromise its operational precision.



Installing ALC damping washers in the laser module significantly enhances the precision of the laser.





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