

Short Fiber vs Long Fiber

Carbon Ceramic Brake Discs

What actually separates an OEM street disc from a track-capable next-generation rotor.

THE SHORT ANSWER

Long fiber is the stronger architecture.

Short fiber is the high-volume OEM construction used on most factory carbon ceramic systems. It is proven for street and light track use. Long fiber costs more to manufacture and is the better choice when the car will see repeated high-energy stops and thermal cycling.

SHORT FIBER	CHOPPED / DISCONTINUOUS	LONG FIBER	CONTINUOUS / WOVEN / 3D-NEEDED
CONSTRUCTION Chopped carbon fibers (typically under 5–10 mm) mixed with resin, molded, carbonized, then silicon-infiltrated (LSI). Fibers sit randomly in the ceramic matrix.		CONSTRUCTION Continuous carbon cloth or felt stacked and usually needed into a 3D preform, then densified (CVI) and silicon-infiltrated. Fibers run through the part.	
HOW IT LOOKS Friction face often shows a carbon-flake appearance. Cut edge is random — no woven layers.		HOW IT LOOKS Friction faces can look similar. The cut edge shows layered or interwoven reinforcement — that is the tell.	
WHY OEMS USE IT Lower cost, faster cycle time, easier to mold complex vented one-piece hats at production volume.		WHY IT COSTS MORE Preform labor, longer densification, tighter process control. Fiber itself is not the only cost driver.	
BEST USE Street cars and occasional track days. Most factory Brembo / SGL-style CCB and CCM discs.		BEST USE Regular track use, endurance, high thermal cycling, or any application where crack resistance and resurfacing matter.	

Typical published material properties

Representative ranges from industry and research literature. Not a guarantee for any specific disc.

PROPERTY	SHORT FIBER	LONG FIBER	WHAT IT MEANS ON THE CAR
Tensile strength	20–40 MPa	80–165 MPa	Resistance to pulling apart under load
Flexural strength	50–80 MPa	150–230 MPa	Resistance to bending / bell and plate stress
Elastic modulus	30–60 GPa	60–120 GPa	Stiffness; less flex under pedal force
Thermal conductivity	20–40 W/m·K	40–80 W/m·K	Heat leaves the face faster; fewer hot spots
Crack behavior	Isolated fiber islands	Fiber bridging (rebar effect)	Long fiber arrests cracks instead of feeding them
Typical role	OEM street volume	Track / next-gen aftermarket	Match the architecture to how the car is driven

HOW TO TELL THEM APART

Do not judge from the friction face.

The pad surface on short-fiber and long-fiber discs can look nearly identical. The difference is on a cut edge or a broken hat: short fiber is random flake with no consistent orientation; long fiber shows stacked, woven, or needed layers. If a seller cannot provide a cross-section photo, treat the construction claim as unverified. Surface cracks on a new disc — either type — are a reject.

Why fiber length shows up on track

A crack in a ceramic matrix takes the cheapest path. Short fibers sit as isolated islands. Once a crack gets around them, it runs. Long fibers act like rebar in concrete: they bridge the crack, force it to deflect, and absorb energy. That is why long-fiber discs survive repeated heat cycles – ambient to 700–900 °C and back – with less structural damage, and why some of them can be resurfaced instead of scrapped.

01

THERMAL CYCLING

Street use rarely hammers the disc through full heat cycles. Track sessions do. Fiber bridging is what keeps micro-cracks from becoming a through-crack in the plate or hat.

02

HOT SPOTS AND FADE FEEL

Higher through-thickness and in-plane conductivity on long-fiber parts spreads heat. That reduces local overheating, uneven pad transfer, and the “one corner went away” feeling.

03

SERVICE LIFE

Short-fiber discs are generally treated as one-life parts. Continuous-fiber 3D matrix discs from quality makers can often be machined and returned to service if the structure is intact.

How we spec a disc

STREET / OCCASIONAL TRACK

- Short fiber is acceptable when quality and coating (if used) are good.
- This is the architecture most factory carbon ceramic cars already use.
- Prioritize consistent SiC content, coating integrity, and hat attachment over marketing language.
- Treat surface cracks – even on a new disc – as a reject.

REGULAR TRACK / ENDURANCE

- Specify long fiber (continuous / 3D-needed) in the plates at minimum.
- Hybrid builds exist: short-fiber body with continuous-fiber friction rings.
- Uncoated CCM and coated CCB are different products – match pad compound to the surface.
- Ask for cut-edge photos, density, and residual silicon – not just “carbon ceramic.”

Fiber length is not the only variable

SIC VS RESIDUAL SI

Too much free silicon softens high-temperature behavior. Too little can hurt densification and conductivity.

COATING

A real SiC friction layer (often 0.6 mm+) changes wear and oxidation vs an uncoated CCM face. Thin cosmetic coats do not.

FIBER GRADE

T700 continuous fiber is stronger and oxidizes slower than common T300 chopped fiber. Grade and architecture both matter.

PROCESS CONTROL

A well-infiltrated short-fiber disc beats a poorly densified long-fiber disc. Ask who runs CVI / LSI and how they inspect.

HAT JOINT

Two-piece hats, bushings, and floating hardware fail independently of the ceramic. Geometry and hardware are part of the spec.

PADS

Carbon ceramic discs require a compound designed for that surface. Iron-pad thinking does not transfer.

Need a disc spec for a specific car and duty cycle?

Speed By Design can review fitment, fiber architecture, coating, and pad pairing before you buy.

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