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PETG-CF

Carbon-fibre-reinforced PETG: the stiffness of a filled material with PETG's toughness and heat margin, in a matte carbon finish — the most capable material in this series, and the most demanding on hardware.

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PETG-CF adds chopped carbon fibre to a PETG base. Where PLA-CF gives you stiffness in a material that still softens at 55 °C, PETG-CF gives you stiffness in one that holds to about 70 °C, absorbs knocks and tolerates the outdoors. The datasheet shows the best all-round balance in this series: the highest flat-direction impact toughness of any unmodified material here (41 kJ/m²), a bending modulus of 2900 MPa, a Vicat softening point of 85 °C, and a Z-direction tensile strength that holds better than most filled materials. It prints matte and slightly textured with a subtle carbon sheen, and layer lines nearly vanish. The price of all this is hardware: a hardened steel nozzle of 0.4 mm or more is mandatory, the fibre dust is a skin and eye irritant, and it must be dried before use. One colour — black — and the highest price per kilogram in the range.

FEELS LIKE

Matte, dry, rigid, faintly textured

A moulded carbon composite; fibres catch the light as a soft sheen

STIFFNESS

Highest of the PETGs

Bending modulus 2910 MPa; 50 % above PETG Basic

TOUGHNESS

Best in the series (flat)

41.2 kJ/m² unnotched, 15.7 notched — PETG-CF does not snap at corners

HEAT

About 70 °C, Vicat 85 °C

The highest softening point published in this series

NOZZLE

Hardened steel, 0.4 mm minimum

Carbon fibre destroys brass; no 0.2 mm

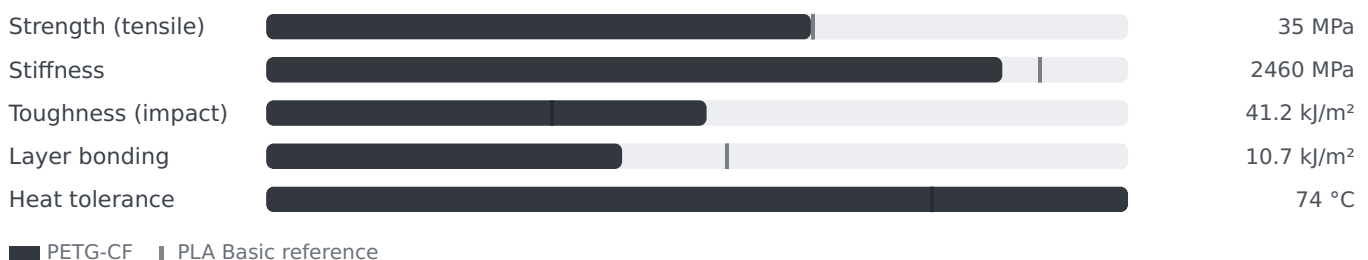
COLOUR

Black only

€31.99 per kilogram — the premium material of the range

Where it sits in the range

Each bar shows this material against the strongest value found anywhere in this series of guides, PLA and PETG together (bar full = best in the series). The dark tick marks plain PLA Basic, the material most people know, so you can see at a glance where this one gives up or gains something. Values come from the manufacturer's own datasheets, measured on test bars printed flat (X-Y).



Good for

- Drone frames, arms and camera mounts where stiffness per gram and crash survival both matter

- Functional brackets, fixtures and machine parts that see warmth, vibration and load
- RC car chassis, suspension parts and racing-model components
- Enclosures and panels that must look engineered straight off the printer
- Outdoor structural parts — mounts, clamps, housings — kept below 70 °C
- Any PLA-CF application that turned out to need heat or impact resistance

Not the right choice for

- Parts loaded across their layers — the fibres do not bridge layers, and Z bending stiffness is barely half of flat
- Real heat above 70–75 °C: engine bays, hot enclosures, near heaters
- Fine detail through small nozzles, or any unhardened nozzle
- Food contact; no certification, and loose fibres rule it out in principle
- Children's items and anything sanded without protection, because of fibre fragments
- Multi-colour work — one colour exists

What carbon fibre does inside PETG

Short carbon fibres align with the direction of extrusion and stiffen each printed line enormously along its length; across lines and across layers they contribute little. The datasheet shows it plainly: a flat bending modulus of 2910 MPa falls to 1560 MPa across layers, and flat tensile modulus of 2460 MPa falls to 1340. The fibres also raise the softening point — Vicat 85 °C against 69 for PETG Basic — and, in PETG, they do not embrittle the matrix the way they do in PLA: unnotched impact rises to 41 kJ/m² and notched to 15.7, both the best of any PETG here. The manufacturer's store page claims 59 MPa tensile strength; the datasheet says 35, and the datasheet is used in this guide. Fibre makes the melt abrasive enough to open a brass nozzle within a spool, so hardened steel is required, and broken fibre ends at cut filament and sanded surfaces can penetrate skin. The matte, faintly textured surface with its carbon sheen is a by-product the market values.

2 · Living with a PETG-CF print

A PETG-CF part is the one in this series you can treat like an engineering component — within its heat limit, and with respect for fibre dust.

Heat	Softens from about 70 °C (glass transition 68 °C, HDT 74 °C at light load, Vicat 85 °C). Parked cars, hot tap water and warm electronics enclosures are fine; ovens, hot lamps and engine bays are not.
Sunlight	Carbon fibre is UV-opaque and the black pigment adds protection; PETG itself tolerates outdoor use. Expect a slow surface greying over years, not embrittlement.
Water and damp	Insoluble and unaffected in use; suitable for outdoor mounts and marine-adjacent fittings.
Chemicals	Resists most oils and greases; not strong acids or alkalis; some solvents attack it. Isopropyl alcohol is safe.
Food	No food-contact certification; loose carbon fibre makes it unsuitable regardless.
Skin contact	Smooth printed surfaces are fine. Rough edges, broken surfaces and cut filament release fibre fragments that irritate skin and eyes — handle with gloves, do not rub.
Load over time	The stiffest and most creep-resistant material in this series at room temperature; still a thermoplastic when warm.

Looks and feel

Deep matte black with a fine surface texture and a soft, directional carbon sheen where fibres meet the surface. Layer lines are nearly invisible. Parts look like moulded composite components and need no finishing.

Care

- Wipe clean; wear gloves for rough or broken edges
- Keep below 70 °C
- Sanding releases carbon-fibre dust: wet-sand only, with mask and goggles, and wash hands after
- No finishing normally needed; primer adheres well if painting
- Superglue and epoxy bond well to the matte surface

Gloves and goggles

Carbon-fibre filaments can leave hard microscopic fibre fragments at cut ends, on rough surfaces and in sanding dust. The manufacturer advises cut-resistant gloves and eye protection when handling the filament, removing supports and finishing prints. Its datasheet lists no skin hazard; follow the more cautious guidance.

What PETG actually is

PETG is the plastic of the clear drinks bottle, adapted for printing. The base polymer is PET — polyethylene terephthalate — and the G stands for glycol, a second building block added to the chain so that the material no longer crystallises when it cools. That one change gives PETG its character: it stays clear or evenly tinted instead of going milky, it is noticeably tougher than PLA and yields before it breaks, and it has no true melting point, only a softening range. Its glass transition sits around 65–80 °C, some ten to twenty degrees above PLA, which is enough to survive a parked car, hot tap water and most sunny windowsills.

The same chemistry brings three habits every PETG user learns. It is hygroscopic: a spool left open for a day or two absorbs enough moisture to string and bubble, so drying is part of the routine rather than a fix. Its melt is sticky, which is why it strings between towers and why it bonds so well to a smooth print bed that it can pull chips out of the surface — glue on the plate acts as a release layer, not an adhesive. And it dislikes strong cooling: fan speeds that suit PLA weaken PETG's layer bonds. PET is one of the most recycled plastics in the world, but a printed PETG part is not accepted in household bottle recycling; it goes to general waste or a dedicated 3D-print recycling stream. Every PETG in this series is the same polymer with a different additive package, flow modifier, colourant or fibre, and each guide explains what that change does.

3 · How it is printed

PETG-CF combines PETG's habits — dry it, glue the bed, keep the fan low, close the door — with the hardware rules of a fibre-filled material. The manufacturer explicitly warns against open-frame printers and strong cooling for this grade, because both weaken the layer bond that fibre already compromises.

Manufacturer print window

Nozzle temperature	240–270 °C (specimens printed at 255 °C)
Bed temperature	65–75 °C

Build plates	Engineering Plate, High-Temperature / Smooth PEI, Textured PEI
Bed adhesive	Glue stick or liquid glue (PVP) recommended
Chamber	35–50 °C — an enclosed printer with the door closed; avoid open-frame machines
Print speed	Up to 200 mm/s (specimens 150 mm/s)
Part cooling fan	0–60 %; keep it low for layer adhesion
Retraction	0.8–1.4 mm at 30–60 mm/s
Max overhang without support	About 70°
Max unsupported bridge	About 30 mm
Support material	Required for overhangs beyond the limit; Support for PETG

Hardware and compatibility

Nozzle sizes	0.4, 0.6 and 0.8 mm; 0.2 mm not offered for this material
Nozzle material	Hardened steel required; brass and stainless wear rapidly
Abrasive	Yes, strongly; wear rate not published
Automatic material systems	AMS compatible with RFID profiles; the manufacturer's filament table advises against AMS lite for this grade
Spool identification	RFID tag
Printers	All enclosed models; open-frame printers not recommended for this grade

Moisture, drying and storage

PETG-CF has the lowest moisture uptake of the PETGs (0.30 %) but the manufacturer still requires drying before use — wet fibre-filled PETG prints rough, weak and stringy.

Forced-air oven or filament dryer	65 °C for 8 hours
Heated print bed method	75 °C for 10 hours, covered (store page)
AMS 2 Pro / AMS HT	Not stated for this grade; 65 °C for 8 hours is the manufacturer's PETG Basic figure
Storage	Sealed with desiccant, below 20 % relative humidity
Annealing	Datasheet gives 55–60 °C for "65–70 hours" — almost certainly a misprint for 6–12 hours; PETG grades are otherwise marked not recommended for annealing

Tips that make a visible difference

- Design for flat loading: put ribs, bosses and load paths in the X-Y plane; the fibres do nothing across layers
- A 0.6 mm hardened nozzle prints faster, clogs less and spreads wear over a larger orifice
- Fan at 20–30 % and door closed; the manufacturer specifically warns that excess cooling costs Z adhesion on this grade
- Cold-pull with PETG Basic or PLA every few spools to clear fibre residue from the melt zone
- Cut filament with side cutters into a bin; do not snap it by hand

Known problems and their fixes

Clogs and under-extrusion

Fibre build-up or a too-small nozzle. 0.4 mm hardened or larger, cold pull, dry the spool, stay under 200 mm/s. The manufacturer markets this grade as less clog-prone than earlier PETGs, but it is not immune.

Nozzle wears; walls get fat and sloppy

Brass or stainless nozzle. Hardened steel only, and expect faster wear than with plain PETG.

Part splits along a layer

Cooling too high or chamber too cold — the manufacturer's own warning for this grade. Fan down, door closed, nozzle toward 260 °C; reorient the load.

Stringing

Moisture. Dry at 65 °C for 8 hours.

Plate damage on removal

Over-adhesion. Glue on the plate, bed 60–65 °C, cool fully before removal.

Skin irritation after handling

Fibre fragments. Gloves; avoid rubbing rough surfaces.

4 · The numbers — technical datasheet

Figures are from the PETG-CF Technical Data Sheet V3.0 (specimens printed at 255 °C / 70 °C bed / 150 mm/s, 100 % infill). Melt flow was measured at 250 °C. One annealing duration on the sheet appears to be a misprint and is flagged.

Physical and thermal properties

Property	Test method	Value
Density	ISO 1183	1.25 g/cm ³
Melt flow index (250 °C, 2.16 kg)	ISO 1133	19.3 ± 2.4 g/10 min
Melting temperature	DSC, 10 °C/min	225 °C (reported; PETG is essentially amorphous)
Glass transition temperature	DSC, 10 °C/min	68 °C
Vicat softening temperature	ISO 306	85 °C
Heat deflection temperature, 0.45 MPa	ISO 75	74 °C
Heat deflection temperature, 1.8 MPa	ISO 75	68 °C
Saturated water absorption (25 °C, 55 % RH)	—	0.30 %

Mechanical properties

Property	Test method	X-Y (flat)	Z (across layers)
Young's modulus	ISO 527	2460 ± 230 MPa	1340 ± 150 MPa
Tensile strength	ISO 527	35 ± 5 MPa	29 ± 4 MPa
Elongation at break	ISO 527	10.4 ± 0.6 %	4.7 ± 0.4 %
Bending modulus	ISO 178	2910 ± 260 MPa	1560 ± 180 MPa
Bending strength	ISO 178	70 ± 5 MPa	48 ± 4 MPa
Charpy impact, unnotched	ISO 179	41.2 ± 2.6 kJ/m ²	10.7 ± 1.6 kJ/m ²

Property	Test method	X-Y (flat)	Z (across layers)
Charpy impact, notched	ISO 179	15.7 ± 1.6 kJ/m ²	not published

The manufacturer's store page quotes 59 MPa tensile strength for this product; the datasheet value of 35 MPa is used here.

What the mechanical numbers mean in practice

Read the bending row for the stiffness and the impact row for the reason to choose PETG-CF over PLA-CF. Flat bending modulus of 2910 MPa is 50 % above PETG Basic; notched impact of 15.7 kJ/m² is double PLA-CF's 7.6 and the highest of any unmodified material in this series — a PETG-CF bracket with a sharp corner survives what a PLA-CF one would not. Tensile strength is unremarkable at 35 MPa, and Z retention in tension is good at 83 %, but the Z bending modulus (1560 MPa) and Z elongation (4.7 %) show where the fibres stop helping. The thermal block — Tg 68, HDT 74 at light load, Vicat 85 °C — is the best in the series and the second half of the argument for choosing it over any PLA.

Product format

Diameter	1.75 mm (tolerance not stated on the datasheet; ± 0.03 mm is the manufacturer's standard)
Net weight	1 kg
Spool	ABS, 200 × 67 mm, rated to 70 °C; ships with desiccant
Colours	1: Black
Price	€31.99 per kg (EU store, excl. VAT) — the highest in the range
Identification	RFID tag
Datasheet version	V3.0

Safety, certifications and chemical resistance

- Declared composition PETG and carbon fibre; odourless; the datasheet lists no skin hazard, but fibre fragments at cut ends and in sanding dust are a recognised irritant — gloves and eye protection advised
- Flammable; combustion products water and carbon oxides
- RoHS and REACH compliance stated across the filament line; no safety data sheet located for this grade
- No food-contact certification; no emissions data published
- Wet-sand only, with mask and goggles; dispose of fibre dust and offcuts in a closed bin
- Resistant to most oils and greases; not to strong acids, alkalis or some organic solvents

5 · Compared with Polymaker and SUNLU

Carbon-fibre PETG is a small but growing category. Polymaker sells it under its Fiberon composites brand, with a recycled-fibre twist; SUNLU sells a 10 % carbon PETG at a budget price.

Polymaker

Fiberon PETG-rCF08 (8 % recycled carbon fibre)

Polymaker's version uses 8 % recycled carbon fibre, prints from 240 to 270 °C with the fan off and a 60–70 °C bed, and is rated to 300 mm/s. It ships only on 3 kg spools — the fibre-filled filament is too brittle to wind onto a 1 kg core — and Polymaker warns to be careful with abrasive materials in a material system even though its spools now fit. A hardened nozzle is essential. Mechanical values were not retrieved for this guide and are marked not published.

Carbon fibre content	8 %, recycled
Mechanical data	not published (TDS not retrieved)
Nozzle / bed	240–270 °C / 60–70 °C
Fan	0 % (max 50 %)
Speed	30–300 mm/s
Nozzle	hardened, essential
Spool	3 kg only
Enclosure	not required; door open

SUNLU

SUNLU PETG-CF (10 % carbon fibre)

SUNLU states a 10 % fibre content and publishes 32 MPa tensile, 55.5 MPa flexural, 71 °C HDT and a notched Izod of 7 kJ/m² — weaker in bending than Bambu's and, on a different impact test, less tough. Prints cooler and slower (240–250 °C, ≤ 150 mm/s) on a 50–70 °C bed. No nozzle or drying guidance is published, though both apply. Black only; tight ±0.02 mm tolerance; the cheapest of the three.

Carbon fibre content	10 %
Density	1.23 g/cm ³
Tensile	32 ± 4 MPa
Flexural strength	55.5 ± 5 MPa
Izod notched	7 ± 2 kJ/m ²
HDT	71 ± 3 °C
Nozzle / bed / speed	240–250 °C / 50–70 °C / ≤ 150 mm/s
Diameter	1.75 ± 0.02 mm

Reading cross-brand numbers fairly

Manufacturer datasheets are produced by different labs on different printers, and two numbers are comparable only when the test standard, specimen orientation and impact method match. Charpy and Izod impact results are not interchangeable; notched and unnotched results differ by a factor of three or more; and Polymaker publishes Z-direction data where SUNLU publishes none. Treat cross-brand figures as an indication of class, not a ranking. Where a brand's marketing claim is not backed by its own datasheet, this guide says so.

Bottom line. Bambu's PETG-CF has the strongest published datasheet of the three and RFID presets on its own hardware, at the highest price. Polymaker's Fiberon grade is the production choice — 3 kg spools, 300 mm/s, recycled fibre — for anyone printing it in volume. SUNLU's is the budget entry with the thinnest data. All three need hardened steel, gloves and a closed door.

How to read the datasheet

X-Y vs Z

A 3D print is a stack of layers. X-Y describes a test bar printed lying flat, where the load runs along the extruded lines. Z describes a bar printed standing up, where the load tries to pull the layers apart. Z values are always lower, and the ratio between them tells you how well the layers have fused. Real parts fail along layer lines far more often than through them.

Tensile strength (MPa)

The stress at which a bar pulled from both ends breaks. Megapascals are newtons per square millimetre: a 10 mm × 10 mm cross-section of a 35 MPa material holds roughly 3.5 kN, about 350 kg, before it snaps in a slow pull.

Young's modulus (MPa)	Stiffness — how much force it takes to stretch the material by a given amount. Higher means more rigid. It says nothing about strength: a stiff material can still be brittle.
Elongation at break (%)	How far the bar stretched before it broke, as a percentage of its original length. Low values (under 5 %) mean the material snaps with little warning; higher values mean it yields and bends first.
Bending (flexural) strength and modulus	The same two ideas measured by pressing down on the middle of a bar supported at both ends — closer to how brackets, clips and shelves are actually loaded.
Charpy impact (kJ/m²)	A pendulum hammer strikes the bar; the energy it absorbs before breaking is divided by the fracture area. This is the best single indicator of toughness — resistance to drops and knocks. Unnotched bars measure the bulk material; notched bars have a small cut that concentrates stress and give much lower numbers. Never compare a notched figure with an unnotched one, or a Charpy figure with an Izod one (a different test geometry).
Glass transition, T_g (°C)	The temperature at which the polymer's chains gain enough mobility for it to change from glassy and rigid to leathery and soft. Above T _g a loaded part will slowly creep and deform. For PLA and PETG this is the single most important thermal number.
Heat deflection temperature, HDT (°C)	The temperature at which a bar under a fixed bending load sags by a set amount. Quoted at 0.45 MPa (light load) and 1.8 MPa (heavy load); the light-load figure is always the higher of the two. Practical rule: keep loaded parts well below the 0.45 MPa figure.
Vicat softening point (°C)	The temperature at which a needle under load penetrates 1 mm into the material. Another measure of when the surface stops being hard.
Melting temperature, T_m (°C)	Where the crystalline regions melt, measured by DSC (a calorimeter). Printing happens well above T _m so the polymer flows freely.
Melt flow index, MFI (g/10 min)	How much molten material flows through a standard die in ten minutes under a fixed weight (210 °C for PLA; PETG sheets use 210–250 °C, so compare only at equal temperature). Higher means runnier and easier to push at speed; lower means more viscous, which is why some variants have lower speed limits.
Water absorption (%)	How much moisture the filament takes up from air at 55 % relative humidity. Absorbed water boils in the nozzle, causing pops, bubbles, stringing and rough surfaces — hence the drying recommendations.
Density (g/cm³)	Mass per volume. A 1 kg spool of a 1.31 g/cm ³ material contains about 5 % less printable length than a 1 kg spool at 1.24 g/cm ³ — heavier fillers cost you metres.
Annealing	Baking a finished print at a temperature just above T _g to let it crystallise further. It can raise heat resistance and stiffness but usually shrinks and sometimes warps the part.

Data notes and sources

Where sources disagree

- Tensile strength: the manufacturer's EU store page quotes 59 ± 4 MPa; the V3.0 datasheet gives 35 ± 5 MPa. The datasheet is used.
- Annealing: the datasheet prints "55–60 °C, 65–70 hours"; every other sheet in the range gives 6–12 hours and the PETG sheets mark annealing not recommended. Treated as a misprint.

- Heated-bed drying (75 °C, 10 h) is from the store page; the datasheet gives only the oven figure.
- AMS lite: the manufacturer's filament table advises against AMS lite for PETG-CF; the store page says only "AMS compatible".
- Polymaker Fiberon PETG-rCF08 mechanical values were not retrieved; the comparison is limited to print settings and format.

Sources

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