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What is PTFE K15 EN

PTFE K15

PTFE + 15 % carbon/graphite (K15) – carbon/graphite-filled PTFE compound

PTFE K15 is a PTFE (polytetrafluoroethylene) filled with 15 % carbon/graphite. The filler noticeably improves wear resistance, cold flow and friction behaviour compared with virgin PTFE and also makes the material more electrically conductive, without significantly limiting the near-universal chemical resistance typical of PTFE. This makes K15 a balanced intermediate grade between virgin PTFE and more heavily filled carbon/graphite compounds such as K25.

Definition and basic character

PTFE K15 consists of a PTFE matrix with 15 percent by weight of carbon or graphite filler. PTFE is a semi-crystalline fluoropolymer that is not melt-flowable and, like virgin PTFE, is therefore only machined, not welded. The embedded carbon/graphite content improves compressive and wear resistance, further lowers the coefficient of friction, and increases electrical conductivity compared with virgin PTFE, which is otherwise an excellent insulator. The colour is consistently black.

How PTFE K15 is manufactured and processed

PTFE K15 is machined from pressed and sintered semi-finished stock (sheet, rod, bush) – turning, milling, drilling and sawing all work well. Like all PTFE materials, K15 is not meltable/weldable; overheating must be avoided during machining (thermal decomposition from approx. 260 °C). Because carbon/graphite dust is electrically conductive, consistent dust extraction is essential during machining to avoid deposits inside electrical equipment.

Why carbon/graphite? Wear, friction, conductivity

Virgin PTFE is chemically and thermally excellent but mechanically soft, prone to creep, and a very good electrical insulator – undesirable in applications where electrostatic charge must not build up uncontrolled. The 15 % carbon/graphite content noticeably improves compressive strength, wear and creep behaviour, further lowers the already low PTFE friction coefficient (graphite itself acts as a dry lubricant), and increases electrical conductivity. Unlike glass fibre, carbon/graphite barely affects chemical resistance – resistance to hydrofluoric acid, which limits glass-fibre-filled PTFE, is largely retained in K15. Carbon/graphite filler is also significantly less abrasive to soft counter-surfaces (e.g. bronze, aluminium) than glass fibre.

Mechanical, thermal and electrical properties

PTFE K15 achieves a tensile strength from around 14 MPa at an elongation at break from around 115 % and a hardness of 58–62 Shore D; density is around 2.15 g/cm³. The material can be used from -200 to +260 °C, is non-flammable (UL 94 V-0), and the friction coefficient stays very low at around 0.15. At this filler level, K15 is still only weakly conductive to insulating (volume resistivity around 10^{10}–10^{11} Ω·cm) – for reliably antistatic or conductive applications, the more heavily filled K25 is usually the safer choice. Chemically, K15 is near-universally resistant, including largely resistant to hydrofluoric acid; limits exist with fluorine and molten alkali metals.

K15 or K25 – which filler level?

Both compounds use the same filler but differ in content and therefore in properties:

- K15 (15 % carbon/graphite) – somewhat higher elongation and toughness, more moderate improvement of wear and creep, only weakly conductive
- K25 (25 % carbon/graphite, standard grade) – maximum wear resistance and lowest friction, reliably electrically conductive/antistatic, but somewhat lower elongation/toughness
- For purely tribological applications without a conductivity requirement, K15 is often sufficient; for ESD/antistatic requirements or maximum wear resistance, K25 is the standard choice

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When PTFE K15 is the right choice

PTFE K15 is worthwhile when the benefits of PTFE need to be combined with better wear resistance and some electrical dissipative capability, without giving up as much toughness as possible – for example:

- Plain bearings, slide strips and guide elements with moderate wear loading
- Seals and piston rings where cold flow needs to be reduced
- Applications with a light requirement for electrical dissipation
- Chemically loaded sliding and sealing parts up to 260 °C, including hydrofluoric acid contact
- Components where lower abrasiveness to the counter-surface is needed compared with glass-fibre compounds

When PTFE K15 is NOT the right choice

The limits of the material are equally important:

- Reliably defined, low electrical dissipation resistance (ESD requirements) – here K25 is the more reliable choice
- Maximum wear resistance under sustained high load – K25 is better suited for this
- Unambiguous food contact without evidence (then virgin/FDA-compliant PTFE)
- Contact with fluorine or molten alkali metals (attack)
- Joining by welding – not possible with PTFE (machining only)

What does PTFE K15 cost?

PTFE materials are among the higher-priced engineering plastics; carbon/graphite-filled grades such as K15 are in the range of virgin PTFE or slightly below. The component price is mainly determined by the semi-finished form and dimensions, material utilisation (offcut), machining effort and batch size. We are happy to provide binding prices on request based on your drawing.

Machining at Liedtke

PTFE K15 machines well – turning, milling, drilling and sawing all give clean results. Because the carbon/graphite dust is electrically conductive, we consistently ensure dust extraction and avoid deposits in the machine area; overheating is avoided throughout. This is how we reliably manufacture low-wear sliding, sealing and functional parts – from one-off parts to series production.

Advantages and disadvantages at a glance

An honest assessment – and how the disadvantages can be mitigated in practice:

Advantages

- Higher wear and compressive resistance than virgin PTFE
- Reduced creep (cold flow) under sustained load
- Very low friction coefficient, self-lubricating
- More electrically conductive than virgin PTFE, good heat dissipation
- Near-universal chemical resistance including hydrofluoric acid retained

Disadvantages

- Lower elongation/toughness than virgin PTFE
- Electrical conductivity at 15 % not yet reliable enough for ESD requirements
- Filled grade – food contact only with evidence
- Not meltable/weldable (machining only)
- Higher price than standard plastics

Practical tip: PTFE K15 is the right choice when moderate wear resistance and some electrical dissipation are needed without giving up much toughness. If reliably defined antistatic conductivity or maximum wear resistance is required, K25 is the standard choice; for maximum chemical resistance or unambiguous food contact, virgin PTFE remains the better option.

Typical Properties

- Higher wear and compressive resistance than virgin PTFE

Product Examples

- Plain bearings and slide strips
- Seals and piston rings

Typical Industries

- Sealing technology

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- Reduced creep (cold flow)
- -200 … +260 °C, non-flammable (UL 94 V-0)
- Near-universal chemical resistance, including hydrofluoric acid
- Very low friction coefficient, self-lubricating
- Weakly conductive to insulating
- Colour black
- Machining only (not weldable)
- Guide elements and wear rings
- Valve seats and components
- Chemically loaded sliding parts
- Components with a light dissipation requirement
- Chemical process and plant engineering
- Pump and valve technology
- Compressor and drive technology
- Mechanical engineering (plain bearings)
- Electronics and semiconductor manufacturing

	Test Method	Unit	Value
Mechanics / Tribology			
Tensile strength	ISO 527	MPa	≥ 14
Elongation at break	ISO 527	%	≥ 115
Hardness	ISO 868	Shore D	58–62
Coefficient of friction	DIN 53375		~ 0.15
Thermal			
Service temperature		°C	-200 … +260
Thermal conductivity	DIN 52612	W / (m * K)	≈ 0.45
Flammability	UL 94		V-0
General			
Density	ISO 1183	g / cm^3	2.15
Volume resistivity	IEC 60093	Ω * cm	~ 10^{10} … 10^{11}
Color			black

PTFE + 15 % carbon/graphite (K15) is a carbon/graphite-filled PTFE compound. The values stated are typical properties; they serve as an aid to material selection and do not constitute a legally binding guarantee of specific properties and may vary by manufacturer. Food-contact suitability of the filled compound depends on the filler and must be confirmed case by case. PTFE must not be overheated (decomposition from approx. 260 °C, releasing hazardous gases).

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