Graphite Gaskets — Comprehensive Properties

1) Flexible / Expanded Graphite (unreinforced graphite foil & sheets)

A — Properties (typical)

Property	Typical / notes
Composition	Expanded (exfoliated) natural graphite — no binders (some grades contain oxidation inhibitors).
Appearance	Thin, flexible dark-grey foil / sheet.
Typical density	~0.7 – 1.4 g/cm³ (product dependent).
Typical thickness range	0.08 mm – 3.0 mm (foil 0.08–1.65 mm common; sheets up to ~3 mm).
Service temperature	≈ -200 °C to +450 °C in non-oxidizing atmospheres; oxidation in air becomes important above ~350–450 °C unless inhibited/impregnated.
Chemical resistance	Excellent to most chemicals, acids and hydrocarbons.
Compressibility & recovery	Good compressibility and conformability; recovery depends on grade and density.
Leakage performance	Good for steam/hydrocarbon service; impregnated grades reduce permeability and improve leak tightness.
Typical limitations / cautions	Oxidation at high T in air (use inhibited/impregnated or metal-clad for oxidizing atmospheres); tensile strength lower than metal.

2) Impregnated / Low-porosity Graphite Sheets

A — Properties (typical)

Property	Typical / notes
Composition	Flexible graphite sheet impregnated with resins/oils/oxidation inhibitors to reduce porosity and leakage.
Appearance	Denser, less dusty surface than plain foil; darker and more robust feel.
Typical thickness	0.3 mm – 3.0 mm (commonly 0.5, 1.0, 1.5, 3.0 mm).
Service temperature	Similar base graphite limits; impregnations can improve oxidation resistance somewhat — check grade for exact limits (service to ~500° C possible in protected environments).
Leakage / permeability	Lower permeability vs unimpregnated graphite — better for vacuum and low-leak requirements.
Mechanical	Improved handling, lower dusting, somewhat improved compressive behavior.

3) Graphite Laminate with Perforated / Tanged Metal Insert (reinforced graphite laminate)

A — Properties (typical)

Property	Typical / notes
Construction	Pure exfoliated graphite bonded/mechanically combined with a perforated stainless-steel insert (e.g., 0.05 - 0.15 mm SS perforated foil) — insert increases blow-out resistance and handling.
Advantages	Higher blow-out resistance, improved dimensional stability and handling, suitable for higher bolt loads vs plain sheet.
Typical thickness	Common laminate thicknesses ~1.0 mm, 1.5 mm, 3.0 mm (example: KLINGER PSM type perforated insert).
Service temperature	Same graphite base limits; metal insert allows better mechanical service at elevated temperatures.
Typical limitations	Metal insert reduces pure graphite surface exposure but choose metal grade for corrosion compatibility.

4) Metal-clad / Metal-faced Graphite (graphite bonded to thin metal foil)

A — Properties (typical)

Property	Typical / notes
Construction	Graphite layer adhesively or mechanically bonded to a thin metal facing (SS 304/316 or alloy foil). Metal face protects graphite from oxidation and provides a corrosion barrier.
Advantages	Combines graphite sealing performance with flange-face protection and improved oxidation resistance.
Typical thickness	Overall ~1.0 – 5.0 mm (metal foil gauge varies; graphite face thickness typically 0.3–2 mm).
Use considerations	Preferred where flange corrosion or abrasion could damage pure graphite; metal face eases handling and improves seating.

5) High-Purity / Low-Halogen Graphite Gasket Materials (nuclear, semiconductor, high-purity chemical)

A — Properties (typical)

Property	Typical / notes
Composition / purity	Ultra-high carbon content graphite (≥ 98 - 99.9% C), low ash, very low halogen (chloride) and sulphur content — manufactured to special specifications for nuclear / semiconductor use.
Typical tests / approvals	Low halogen/chloride certificates, particle shedding tests, special QA traceability; some grades meet nuclear approvals or semiconductor cleanliness requirements.
Temperature & chemistry	Same graphite thermal characteristics but with strict contamination control and lower tolerated impurity content.

6) Graphite as Spiral-Wound Filler & Graphite Spiral-Wound Gaskets (filler variant)

A — Properties (typical)

Property	Typical / notes
Role	Flexible graphite is commonly used as the filler in spiral-wound gaskets (metal + graphite filler). It provides the sealing surface while the metal winding provides spring action.
Typical cross-sections	3 mm, 4.5 mm, 6 mm cross-sections are common (select per flange class/gap).
Temperature / pressure	Depends on winding metal and filler grade — graphite filler allows high-T steam/refinery service (protected grades recommended for oxidizing atmospheres).