Gland Packing Ring — Technical Data Sheet / Datasheet / TDS

Material (common names)	Construction / Typical form	Operating temperature range (typ.)	Chemical compatibility / pH	Friction / lubrication	Key mechanical properties & leakage behaviour	Typical advantages	Typical limitations / notes
Carbon / Carbon-fiber (graphitized / PTFE-impregnated variants)	Braided carbon yarn; sometimes impregnated with PTFE or graphite; available as spool or die-formed rings.	about -200° C to +400° C depending on impregnation (graphite/impregnated types vary).	Very good broad chemical resistance; graphite/impregnated versions tolerate many acids/alkalis (check impregnation).	Low friction; often self-lubricating.	Low extrusion risk when properly supported; forms a conformable mass under gland pressure — excellent sealing on worn shafts.	Low friction, excellent heat dissipation, good for high temp & steam.	Some carbon packings can shed small carbon particles — not suitable where contamination is critical unless specified.
Flexible / Expanded Graphite (graphite yarn)	Braided graphite yarn; also available as graphite foil with reinforcements (wire).	-200° C to +450° C (graphite high temp).	Excellent to most chemicals (except strong oxidizers at high T).	Low friction when lubricated/impregnated; can be abrasive if dry.	Very good sealing, especially for steam and high temp; may require anti-extrusion rings at high pressure.	Excellent high-temperature sealing, good chemical resistance.	Not ideal for oxidizing media at high T; graphite can be abrasive to shafts.
PTFE / Filled PTFE (virgin PTFE, graphite-filled, bronze-filled, aramid-cornered sets)	Braided or die-formed PTFE; sometimes reinforced with aramid or metal inserts.	-200° C to +260° C (PTFE); filled PTFE may vary.	Outstanding chemical resistance (pH 0–14 for many types).	Very low friction; may be “slippery” (good for shafts).	Excellent leakage control for corrosives; may cold-flow under static high loads unless reinforced.	Excellent chemical compatibility; low friction; long life in corrosives.	Lower tensile strength than fibrous packings; extrusion risk — use anti-extrusion rings or metal jackets for high pressure.

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Aramid / Kevlar (aramid fiber, sometimes with PTFE coating)	Braided aramid yarn, sometimes with PTFE impregnation or corner reinforcement in die sets.	-50° C to +250° C (depends on finish).	Good chemical resistance (not as universal as PTFE); resists oils & hydrocarbons well.	Moderate friction; often requires lubrication or PTFE blend.	High tensile strength; resists cutting and extrusion; good for reciprocating pumps/valves.	High strength, good wear resistance, good for dynamic applications.	Not suitable for strong oxidizers or concentrated nitric/hydrogen peroxide; care with high T.
Synthetic braided (ramie, acrylic, nylon, polyester blends)	Natural/synthetic braided yarns (ramie, acrylic) sometimes PTFE-treated.	Varies widely: -40° C to +150° C typical.	Moderate chemical resistance; depends on fiber and impregnation.	Moderate to high friction unless PTFE treated.	Economical; good for general service (water, light chemicals).	Low cost; good for low-to-moderate temperature pump packing.	Not suitable for high temp, steam, strong acids/alkalis unless specially treated.
Metallic / Metal-reinforced (Inconel wires, stainless wire-reinforced graphite foils, die-formed metal rings)	Metal-inforced graphite foil rings or die-formed metal seals.	Very high temp; depends on metal (Inconel, SS) — up to >600° C for alloys.	Good for many media; metal may corrode in some chemistries.	Higher friction; often used in extreme conditions where elastomers fail.	Extremely high pressure and temperature capability; low compressibility.	Use in severe service: high T, erosive, slurry, where polymer packings fail.	Higher friction; can damage shafts; requires compatible gland design.
Composite / Hybrid (carbon core + PTFE sheath; graphite core + metal wire reinforcement)	Combination die sets: core of carbon or graphite with PTFE outer, or graphite with metal wire outer.	Varies: hybrid inherits limits of components (e.g., -200 to +260° C for carbon/PTFE type).	Designed to combine low friction & chemical resistance.	Low friction (PTFE outer) with structural core.	Lower leakage and longer life; often used as combined set in critical pumps & valves.	Balanced performance: low friction + mechanical strength.	More costly; check compatibility of combined materials.