Technical Data Sheet

PTFE Compounds

HaloPolymer offers a range of PTFE compounds designed for production of low-friction articles by compression molding.
These compounds are based on fine-cut granular PTFE powder dry mixed with a range of fillers.
Compounds may have reduced friction and wearing characteristics and improved creep performance compared to pure PTFE.

- Product overview: Compounds are based on granular PTFE and can be used for production of articles for low friction applications.
- Typical applications: General purpose: piston rings, bearings, spacers, skived sheets.
- availability: 20..30 kg cardbox with 2 polyethylene inserts.
- Technical and application assistance: Contact our support team:
  +1 (202) 838-PTFE / 838-7833
  ptfe@halopolymer-usa.com

Standard non-free-flow compounds*:

compound	Parameters			
	Bulk Density, kg/m^3, min	Specific gravity, g/cm^3, min	Tensile Strength, MPa, min	elongation at break, %, min
F4CAR20NFF	500	2.07	16.0	170
F4GL15NFF	470	2.20	22.0	250
F4GL25NFF	460	2.22	19.0	220
F4CF15NFF	460	1.95	16.0	150
F4CAR15M5NFF	470	2.09	15.0	170
F4CAR19GR1NFF	500	2.07	17.0	180
F4CAR15CF5NFF	490	2.0	16.0	120
F4BRR40NFF	650	3.08	23.0	270
F4BRR60NFF	910	3.85	16.5	210

* customized grades available upon request.

STANDARD FREE-FLOW COMPOUNDS*:

Compound	Parameters			
	Bulk Density, kg/m³, min	Specific gravity, g/cm³, min	Tensile Strength, MPa, min	Elongation at break, %, min
F4CAR20 FF	560	2.09	15.8	120
F4GL15 FF	590	2.20	22.6	290
F4GL25 FF	590	2.22	19.0	265
F4CAR19CF1 FF	565	2.07	15.0	140
F4CAR15M5 FF	570	2.07	14.0	140

* Customized grades available upon request.

Filler	Properties of compound	Applications
GRAPHITE	Graphite filled PTFE has low coefficient of friction due to the low friction characteristics of graphite. Graphite is chemically inert. It is also incorporated in combination with other additives such as carbon and glass. Graphite imparts excellent wear properties, especially against soft metals.	Bearings for high speed on fairly hard surface.
GLASS FIBER	Glass fiber is the most commonly used as a filler to improve creep performance of PTFE. Wear characteristics of polytetrafluoroethylene are also improved by adding this filler. This additive is chemically inert in solvents and water. Glass filled compounds perform well in oxidizing conditions. Glass has little impact on the electrical properties of PTFE. Dielectric breakdown strength is affected due to increased porosity of parts.	Valve seats, seals, bearings, requested to resist sliding and chemicals. Suitable for bearings working at low pH values.
MOLYBDENUM SULFIDE	Molybdenum disulfide is a high-performance additive. It improves hardness of the surface while decreasing friction. Electrical properties of the compound are virtually unaffected. It is typically used in small proportions combined with other fillers such as glass. MoS2 reactive to oxidizing acids and inert in most chemicals.	Seals and bearings with high elasticity and lowest friction coefficient. Guide bands. Details needing good resistivity.
CARBON	Carbon reduces creep, increases hardness and elevates thermal conductivity of polytetrafluoroethylene. Wear resistance of carbon filled compounds improves particularly in combination with graphite. Carbon-graphite compounds perform well in non-lubricated applications such as piston rings in compressor cylinders. Carbon filled PTFE may have electrical conductivity.	Seals and bearings with high wear resistance, piston rings, gaskets.
BRONZE	Bronze is the most popular metallic filler, although steel powder is occasionally used. Large quantities (40–60% by weight) of bronze reduce deformation under load and raise thermal and electrical conductivity of PTFE compounds. These two characteristics are beneficial to applications where a part is subjected to be under load at extreme temperatures. Transmission and air-conditioner compressor seals are two examples of such parts. Bronze is an alloy of copper and tin and is attacked by acids and bases. It is oxidized and discolored during the sintering cycle with no impact on the quality.	Unlubricated bearings for high speed on moderately hard surface.
CARBON FIBER	Carbon fiber lowers creep, increases flex and compressive modulus, and raises hardness. These changes can be achieved with glass but less carbon fiber can achieve the same effects. Carbon fiber is inert to both hydrofluoric acid and strong bases which react with glass. Coefficient of thermal expansion is lowered and thermal conductivity is higher for compounds of carbon fiber PTFE. Carbon fiber parts are lubricated with water, that is, wear rate decreases, making them ideal for automotive applications in shock absorbers and water pumps.	Plain bearings, sealing rings, moving parts operating under conditions of limited lubrication or without lubricants.

STORAGE AND HANDLING

Bags with PTFE powder should be stored in a cold dry place. Recommended storage temperature range is 15-20°C. Bags with powder stored below this range should be kept closed until warmed to room temperature. Optimal temperature range for PTFE compression moulding is 20-25°C. Below this temperature PTFE changes its crystalline structure with volume variation of 1-2%, causing formation of cracks in preforms.

Mechanical manipulations with PTFE powders should be reduced. At the temperature higher than 30°C PTFE tends to form clumps.

PTFE powders attract dust and moisture from ambience and should be processed at clean and dry conditions.

Sintering of PTFE is associated with emission of toxic gaseous products. Therefore sintering process should be performed in a ventilated area. Air from the processing zone must be evacuated.

PRESSING

Pressing of PTFE compounds requires careful powder de-clumping. The uniform layer-by-layer mould filling is essential to avoid cracks in preform. The temperature of PTFE powder should be kept above 19° C. Compounds have different optimal preforming pressures.

SINTERING

The preformed PTFE compound is sintered under a temperature program generally containing several temperature steps including: heating, melting of PTFE, dwell above melting point, cooling to crystallization point of PTFE, final cooling. Annealing steps may also be required. Compounds may have different thermal properties and sintering programs.

MACHINING

PTFE compounds are machined in the same way the mild metals are. Good results are obtained with sharp steel tools. Carbide tools shows good performance for glass and coke filled compounds.

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