DAIKIN | Positively Innovative

Daikin Polyflon™ PTFE Products

Product Information Guide for

Aqueous Dispersions

Fine Powders

Granular Molding Powders

Daikin America, Inc. / www.daikin-america.com / 845-365-9500 / 1-800-365-9570

DAIKIN POLYFLON™ PTFE AQUEOUS DISPERSIONS

Daikin Polyflon™ PTFE (polytetrafluoroethylene) dispersions offer a broad range of characteristics including chemical stability, electrical properties, heat resistance, chemical resistance, non-sticking and low-friction properties, and dielectric characteristics.

Daikin Polyflon™ PTFE dispersions are milky-white aqueous dispersions of stabilized minute particles of PTFE obtained by emulsion polymerization of tetrafluoroethylene. PTFE aqueous dispersions are used in a wide range of applications.

Typical Applications:

Architectural fabrics, glass fabrics, laminates, packings, seals, yarns, filter cloth, electrical insulation, battery binder, coatings for cookware, cast film.

Packaging:

Daikin Polyflon™ PTFE dispersions are available in 2,000 lb. totes, 210 lb. fiber drums and 38 lb. pails.

Storage & Handling:

Normal handling:
Wear personal protective equipment (PPE) when handling these materials.

Storage:
Seal containers and store at 38°-77°F. **Do not freeze.** The dispersion should be gently agitated on a periodic basis to prevent settling. High-speed or any kind of violent agitation must be avoided.

Safety:

Dispersion may irritate skin and eyes. Avoid prolonged or repeated contact with skin and eyes. Wash hands before eating or smoking. In case of contact, flush with water. For contact with eyes, get medical attention.

When PTFE resins are heated to temperatures above 260˚C, minor amounts of decomposition products may be given off. These decomposition products may be harmful, and inhalation of these fumes must be avoided. Ovens, process equipment and the working area must be adequately ventilated. For further information, please refer to the Daikin America Material Safety Data Sheet for these products and the "Guide to the Safe Handling of Fluoropolymer Resins 4th Edition," published by the SPI Inc., The Society of Plastics Industry, Inc., 1801 K Street, NW, Suite 600K, Washington, DC, 20006-1301, (202-974-5200).

Typical Properties of Daikin Polyflon™ PTFE Aqueous Dispersions:

	D-210	D-210C	D-310	D-610	D-610C
Polymer Type	Homopolymer	Homopolymer	Modified	Homopolymer	Homopolymer
Solids Content, wt %	59-61	59-61	59-61	59-61	59-61
Surfactant Content, wt % on solids	6.0-7.2	6.0-7.2	6.0-7.2	6.0-7.2	5.5-6.5
Specific Gravity @ 25°C	1.50-1.53	1.50-1.53	1.50-1.53	1.50-1.53	1.50-1.53
Viscosity, cp @ 25°C	35 max.	35 max.	35 max.	35 max.	35 max.
Critical Cracking Thickness, µm	14	14	12	28	28
pH	8.5-10.5	8.5-10.5	8.5-9.5	8.5-10.5	9.5-10.5
Particle Size, µm	0.22-0.25	0.22-0.25	0.22-0.25	0.26-0.30	0.26-0.30

Selection Guide for Daikin Polyflon™ PTFE Aqueous Dispersions:

	D-210	D-210C	D-310	D-610	D-610C
Application					
Glass Cloth Coating	●		●	●	
Battery Binder		●			
Impregnation	●		●	●	
Packings	●			●	
Release Coatings			●	●	
Cast Film					●
Features					
High Molecular Weight		●			●
High Gloss			●		
Good Wear			●		
High Build				●	●
Low Color and Transparency	●	●	●	●	●
General Purpose	●				

Properly processed products (sintered at high temperatures common to the industry) comply with 21 CFR 177.1550 and may be used as articles or components of articles intended to contact food subject to the provisions, including specifications, conditions of use, and limitations, if any, in this regulation. Daikin America, Inc. makes no recommendation about the suitability of these products in the user's intended application. It is the user's responsibility to determine whether its use of Daikin America, Inc. products in a particular application is suitable and will comply with applicable laws and regulations.

DAIKIN POLYFLON™ PTFE FINE POWDERS

Daikin Polyflon™ PTFE (polytetrafluoroethylene) fine powders possess the lowest coefficient of friction, and the highest heat resistance, chemical resistance, electrical properties and non-stick properties of all fluoropolymers.

These soft, white polymers readily adsorb organic solvents resulting in the formation of a paste that can be easily extruded into thin, flexible sections.

Typical Applications:

Insulated electrical wire for aerospace, electric circuits, transformers, electric motors, industrial wiring, high temperature wiring for power stations, electric furnaces, vacuum tubes, and wiring subjected to corrosive chemical environments.

Hoses, tubes for fuels, high-temperature or corrosive fluids in chemical or nuclear plants, foods, chemicals, oil hydraulic equipment, push-pull cables, and wire insulation for electronic equipment.

Thin rods, pump and valve parts, terminals, bushings, and outer insulators.

Unsintered tape for sealing threaded pipe joints, wraps for chemical and heat resistance, insulation of wire or coil, film, and splicing or repairing PTFE extrusion-insulated wires.

Packaging:

Daikin Polyflon™ PTFE fine powders are packaged in 55.1 lb. (25 kg), nestable, plastic drums.

Storage & Handling:

Daikin Polyflon™ PTFE fine powder must be in a completely powdered form to enable uniform pouring when it is blended with extrusion aid. Strong vibrations and shocks should be avoided during transport as these may cause lumps to form. Store the powder at 15°C (60°F) or below. Ideal storage conditions are a dry location with a temperature of 10-15°C (50-60°F). If lumps exist in the powder prior to blending with extrusion aid, the powder should be sifted, using a No. 8 mesh sieve. Care must be taken to pour the powder gently into the sieve and not crush the powder particles.

Safety:

When PTFE resins are heated to temperatures above 260˚C, minor amounts of decomposition products may be given off. These decomposition products may be harmful, and inhalation of these fumes must be avoided. Ovens, process equipment and the working area must be adequately ventilated. For further information, please refer to the Daikin America Material Safety Data Sheet for these products and the "Guide to the Safe Handling of Fluoropolymer Resins 4th Edition," published by the SPI Inc., The Society of Plastics Industry, Inc., 1801 K Street, NW, Suite 600K, Washington, DC, 20006-1301, (202-974-5200).

Typical Properties of Daikin Polyflon™ PTFE Fine Powders:

Property	F-100 Series	F-200 Series	F-300 Series
Average Particle Size[1], µm	500	500	500
Apparent Density[1], g/l	450	450	450
Melting Point[1], ˚C(˚F)	326-328(619-622)	322-328(612-622)	322-328(612-622)
Tensile Strength[2], MPa(psi)	> 25(3626)	> 25(3626)	> 25(3626)
Elongation[2], %	> 300	> 300	> 250
Reduction Ratio[3]	1000 Maximum	4000 Maximum	1500 Maximum
Type of Polymer	Homopolymer	Modified	Modified

[1] Test Method ASTM D-4895, [2] Test Method JIS-K6891, [3] The reduction ratio refers to the cross-sectional area of the resin inside the cylinder of the extruder (S1) and the cross-sectional area of the resin in the die land (S2), R. R. =S1/S2

Selection Guide for Daikin Polyflon™ PTFE Fine Powders:

Application	F-104	F-104U	F-107	F-131	F-201	F-201L	F-205	F-207	F-208	F-301	F-302	F-303
Unsintered Tape	●	●	●	●								
Sealing Tape	●	●	●	●								
Low Specific Gravity Tape	●	●	●	●								
Flat Cable	●	●	●	●								
Tube Wrap			●	●						●		
Small Thin Wall Tubing					●	●	●	●	●			
Thin Wall Electric Wire (AWG 16 & smaller)					●	●	●	●	●			
Thin Wall Electric Wire (AWG 12 & smaller)							●					
Thick Wall Electric Wire (AWG 16 and larger)										●	●	●
Large Thick Wall Tubing										●	●	●
Heat Shrinkable Tubing					●		●			●	●	●
Co-Axial Cable		●	●	●				●	●	●		
Expanded		●	●	●								
High Stretch			●	●								
Low Extrusion Pressure						●						
Excellent Clarity							●				●	●
High Thermal Stability	●	●	●	●			●			●	●	●
High Green Strength					●	●					●	●
Enhanced Stress Crack Resistance							●				●	●

Food Contact Compliance: Properly processed products (sintered at high temperatures common to the industry) made from Daikin Polyflon™ fine powder resin can qualify for use in contact with food in compliance with FDA 21 CFR 177.1550 and European Regulation (EU) No 10/2011. For details and information, please contact your Daikin America, Inc representative.

DAIKIN POLYFLON™ PTFE GRANULAR MOLDING POWDERS

Daikin Polyflon™ PTFE (polytetrafluoroethylene) granular molding powders are fine cut resins well suited for a variety of demanding chemical, mechanical, electrical and non-stick surface applications.

These PTFE resins are fully fluorinated and have the best thermal, electrical, and chemical properties of all fluoropolymers with a continuous service rating of 500°F (260°C). Daikin Polyflon™ PTFE molding powders are available in homopolymer and modified fine cut grades.

Typical Applications:

Chemical and mechanical packings, gaskets, diaphragms, bellows, corrosion-resistant linings, piping components, pump parts, O-rings, V-rings, bushings, slide bearings, etc.

Electrical and other insulating skived tape, insulating sleeves, terminals, connectors, sockets, spacers, electronic parts, laboratory equipment, etc.

Packaging:

Daikin M-12, M-17 and M-18 Polyflon™ PTFE granular molding powders are packaged in 110lb. (50kg) fiber drum containers with poly liners. M-111 and M-112 are packaged in 55lb. (25kg) and 110lb. (50kg) fiber drum containers with poly liners.

Storage & Handling:

Granular molding powders tend to form agglomerates easily; therefore, do not store large quantities of powder in deep containers, and avoid strong vibrations and shock. Storage at temperatures above 19°C tends to promote agglomerate formation. Should agglomerates form, keep the powder at less than 19°C (ideally 15°C or below) for two days then sift through a coarse screen and allow to come to room temperature before molding.

Safety:

When PTFE resins are heated to temperatures above 260˚C, some decomposition products may be given off. These decomposition products may be harmful, and inhalation of these fumes must be avoided. Ovens, process equipment and working area must be adequately ventilated. For further information, please refer to the material safety data sheet for these products and the "Guide to the Safe Handling of Fluoropolymer Resins, 4th Edition" published by SPI Inc., The Society of Plastics Industry, Inc., 1801 K Street, NW, Suite 600K, Washington, DC, 20006-1301, (202-974-5200)

Typical Properties of Daikin Polyflon™ PTFE Granular Molding Powders:

		PTFE			Modified PTFE		Free Flowing	
Property	**Test Method**	**M-12**	**M-17**	**M-18**	**M-111**	**M-112**	**M-531**	**M-532**
Bulk Density, g/l	ASTM D 4894	350	420	480	360	360	740	870
Std. Specific Gravity	ASTM D 4894	2.16	2.16	2.16	2.17	2.15	2.18	2.18
Shrinkage, %	ASTM D 4894	3.1	3.1	3.2	4.4	4.6	3.0	2.9
ASTM Type/Grade	ASTM D 4894	II	II	II	III/1	III/1	IV/1	IV/2
THERMAL								
Melt Point, °C	DSC 2nd melt	327	327	327	324	323	327	327
Continuous Service		500°F (260°C)	500°F (260°C)	500°F (260°C)	500°F (260°C)	500°F (260°C)	500°F (260°C)	500°F (260°C)
MECHANICAL								
Tensile Strength[1] MPa PSI	ASTM D 4894	43(6,237)	43(6,237)	43(6,237)	40(5,802)	40(5,802)	42	41
Elongation[1], %	ASTM D 4894	400	400	400	500	425	380	380
Compressive Strength[2]	ASTM D 695							
0.2% off set, MPa PSI		7.6(1,102)	7.8(1,131)	7.8(1,131)	8.7(1,262)	7.7(1,117)	7.7(1,117)	7.3(1,059)
1% strain		5.0(725)	5.0(725)	5.0(725)	5.9(855)	4.7(682)	4.5(652)	4.7(682)
25% strain		28.2(4,089)	28.1(4,075)	28.1(4,075)	28.6(4,147)	28.3(4,103)	27(4,103)	27(4,103)
Compression Creep Characteristics	ASTM D 621							
Total Deformation, %	25°C-13.7 MPa	18.7	17.2	17.2	10.6	12.9	16.1	15.5
Compression Set, %		8.8	8.6	8.6	3.0	4.8	8.0	7.3
MIT Flexural Life	ASTM D 2178	7×10^6	5×10^6	5×10^6	3×10^6	27×10^6	N/A	N/A
SVI (Stretching Void Index)	ASTM D 4895	270	300	300	62	40	N/A	N/A
ELECTRICAL								
Dielectric Breakdown Voltage, kV/0.1mm		12.5	10.0	10.0	13.5	13.0	8.0	6.0
Dielectric Constant, 10^3 Hz	ASTM D 150	< 2.1	< 2.1	< 2.1	< 2.1	< 2.1	< 2.1	< 2.1

[1]1.5mm thick sheet [2]10 x 20mm sample

Selection Guide for Daikin Polyflon™ PTFE Granular Molding Powders:

	M-12	M-17	M-18	M-111	M-112	M-531	M-532
Type of Polymer	Homopolymer	Homopolymer	Homopolymer	Modified	Modified	Homopolymer	Homopolymer
Selection Guide:	Superior Mechanical & Electrical Properties Thin Film Skiving	General Purpose Filled Compounds	General Purpose Filled Compounds	Excellent Creep Resistance and Weldability, for Sheet Linings, Gaskets, and Compressive Applications	Excellent Flexibility and Weldability for Bellows and Diaphragms	Excellent Flowability Isostatic Molding Automatic Molding Ram Extrusion	Excellent Flowability Isostatic Molding Automatic Molding Ram Extrusion

[1] Resin meets requirements set forth by the 3A Sanitary Standard for multiple-use plastic materials and the USP class VI test for plastic.

[2] Properly processed products (sintered at high temperatures common to the industry) comply with 21 CFR 177.1550 and may be used as articles or components of articles intended to contact food subject to the provisions, including specifications, conditions of use, and limitations, if any, in this regulation. Daikin America, Inc. makes no recommendation about the suitability of these products in the user's intended application. It is the user's responsibility to determine whether its use of Daikin America, Inc. products in a particular application is suitable and will comply with applicable laws and regulations.

Daikin Polyflon™ PTFE Properties

Thermal Properties:

Daikin Polyflon™ PTFE can be used continuously at temperatures up to 260°C (500°F) and for short periods of time at higher temperatures. It also possesses excellent low temperature strength.

Chemical Properties:

Daikin Polyflon™ PTFE is completely inert to attack by all chemicals except high-temperature, high-pressure elemental fluorine gas, molten alkaline metals and chlorine trifluoride.

Electrical Properties:

The non-polar molecular structure makes Daikin Polyflon™ PTFE ideal for use as high-frequency insulating material. The dielectric constant and dissipation factor are uniformly low over a wide frequency range.

Low Friction:

Under ordinary conditions of use, Daikin Polyflon™ PTFE possesses the lowest coefficient of friction of any solid material. Also, the non-stick properties of these products prevent most materials from adhering to them.

Quality/Regulatory:

Daikin Polyflon™ PTFE meets the requirements set forth in the FDA specification 21 CFR 177.1550. Daikin America's manufacturing facility is registered to ISO-9002 (Quality System) and ISO-14001 (Environmental Systems) and Responsible Care 14001 (Safety, Health, Environment, and Security).

Medical Use:

These products are not specifically designed or manufactured for use in implantable medical and/or dental devices. They have not been tested for such applications and we will only sell them for such use pursuant to contract containing specific terms and conditions required by us.