



SOLVAY

asking more from chemistry®

Polymist® | Algoflon®



Polymist® PTFE
Algoflon® L PTFE

Micronized Powders

**SPECIALTY
POLYMERS**



Improved Processing. Improved Performance.

Fully Integrated Supplier and Broad Product Range

Solvay Specialty Polymers is a leading global supplier of fluoropolymers and other innovative materials which provide sustainable solutions that contribute to improving quality of life.

It is the fully integrated supplier of PTFE micronized powders, with production plants in the USA and China to support the growing demand for these materials worldwide.

Solvay Specialty Polymers has full capabilities including monomer, polymer, irradiation and milling operations, together with many other advantages which lead to the best products' offering and service:

- Patented irradiation process for superior process control
- Tight control of melt point and molecular weight distribution
- Tight control of particle size distribution
- Full range of products to meet customer needs
- Product development programs for new applications
- Low molecular weight grades produced by direct polymerization, without irradiation

Polymist® PTFE and Algoflon® L PTFE micronized powders are powerful additives that improve processing and end-use performance



Polymist® and Algoflon® L PTFE Standard product range and main applications

	Plastics	Elastomers	Coatings	Inks	Lubricants
Polymist® F284	++	+		+	
Polymist® F5 A	+	++		++	+
Polymist® F5 A EX	++				
Polymist® XPP 511	++				
Polymist® XPP 515	+				+
Polymist® XPP 535				++	++
Polymist® XPP 538		+		++	++
Polymist® XPP 552				++	++
Algoflon® L100					++
Algoflon® L203					++
Algoflon® L206		++		++	
Algoflon® L600				++	+

+ Recommended ++ Highly recommended

PTFE micronized powders have been commercialized for over 40 years under the trade names Polymist® PTFE and Algoflon® L PTFE.

Polymist® PTFE micronized powders are widely used in plastics, inks and coatings.

Algoflon® L PTFE grades are primarily used in greases, elastomers and coatings and offer premium performance due to their ability to disperse to sub-micron distribution in the final application.

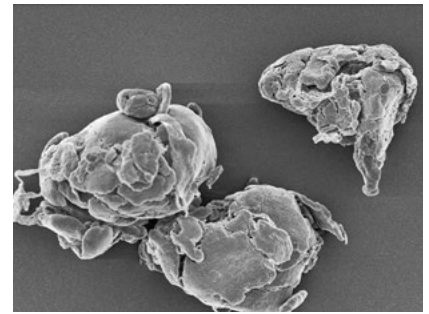
Polymist® PTFE Micronized Powders

Polymist® PTFE micronized powders are composed of discrete particles. These grades are designed with different properties in terms of average particle size, Particle Size Distribution (PSD) and Molecular Weight (MW).

The main features of these grades are:

- Low molecular weight
- Excellent chemical and temperature resistance
- Low surface energy
- Low coefficient of friction
- Good dispersion ability

SEM micrographs of Polymist® F284 PTFE micronized powders
(2,500 x magnification)



	Main Characteristics	Designed for	Other Applications
Polymist® F284 Premium grade	Medium MW grade with excellent thermal stability	Critical, high temperature engineering and high performance polymers	Coatings and elastomers
Polymist® F5 A Premium grade	Low MW grade with fine particle size and tight control of PSD	Coatings and elastomers	Engineering and high performance polymers, thickener in greases and lubricants
Polymist® F5 A EX Premium grade	Medium MW grade with coarse particle size and good thermal stability	Engineering and high performance polymers	
Polymist® XPP 511 Premium grade	Medium MW grade with coarse particle size and excellent thermal stability	Critical, high temperature engineering and high performance polymers	
Polymist® XPP 515	Low MW grade with coarse particle size	Engineering and high performance polymers	Lubricants
Polymist® XPP 535	Low MW, finely milled grade with excellent control of oversize	Inks and coatings	
Polymist® XPP 538	Low MW, finely milled grade with good control of oversize	Inks and coatings	Elastomers
Polymist® XPP 552	Low MW ultra-fine grade with excellent control of oversize	Critical inks and coatings	

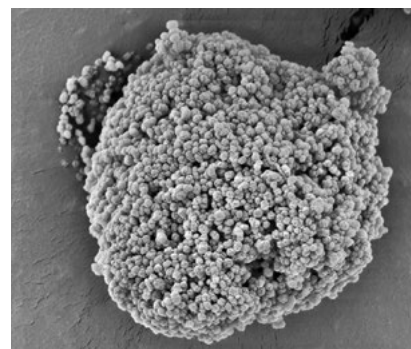
Algoflon® L PTFE Micronized Powders

Algoflon® L PTFE micronized powders are produced from dispersion polymerization and are agglomerates of sub-micron primary particles with higher Specific Surface Area than Polymist® PTFE grades. Algoflon® L PTFE micronized powders can be de-agglomerated to sub-micron particle size by the application of shear. Algoflon® L PTFE grades are specifically designed with different properties in terms of Particle Size Distribution (PSD), Specific Surface Area (SSA) and Molecular Weight (MW).

The main features of these grades are:

- Low molecular weight
- High specific surface area
- Excellent chemical and temperature resistance
- Low surface energy
- Low coefficient of friction
- Good dispersion ability
- De-agglomerated under shear to sub-micron particle size

SEM micrographs of Algoflon® L203 PTFE micronized powders
(25,000 x magnification)



	Main Characteristics	Designed for	Other Applications
Algoflon® L100 Premium grade	Low MW grade with ultra-high SSA Produced by direct polymerization	Thickener in critical greases and lubricants	
Algoflon® L203 Premium grade	Medium MW, finely milled grade with good control of oversize	Thickener in high quality greases and oils	
Algoflon® L206 Premium grade	Medium MW, finely milled grade with good control of oversize	Elastomers and coatings	
Algoflon® L600 Premium grade	Low MW, finely milled grade with excellent control of oversize and good dispersion ability	Coatings	Additive for lubricants

Applications

Plastics

For dynamic, load-bearing applications (gears, cams, bearings, slides, etc.), Polymist® and Algoflon® L PTFE can help provide:

- Improved wear resistance
- Increased Pressure x Velocity (PV) limits
- Reduced friction and stick-slip response

The mechanism by which PTFE micronized powders provide self lubrication is by the transfer of Polymist® and Algoflon® L from the PTFE lubricated polymer to the mating surface. A thin PTFE film is formed when the PTFE-filled part is in contact with the mating surface under low pressure conditions. The resulting PTFE film provides excellent lubricating properties and extended service life of the part without the use of external lubrication.

Polymist® and Algoflon® L PTFE can be used in a wide variety of different thermoplastics. Typical loadings are 5–20 % by weight of the compound and the optimum loading is dependent by the resin type and the desired final properties of the part.

Besides its main function as a friction and wear additive, Polymist® PTFE and Algoflon® L PTFE can be also used at lower concentration to provide the following properties:

- Processing aid to improve compounding and molding conditions
- Mold release agent due to non-stick properties

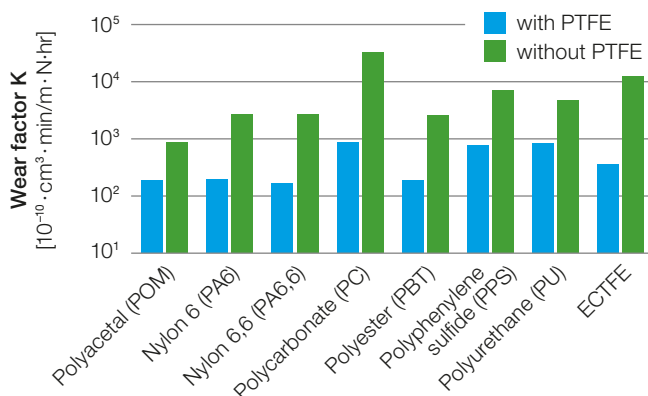
The grade selection of Polymist® and Algoflon® L PTFE for each application is driven by many factors. Molecular weight (MW) and particle size, among other properties, have to be taken into consideration to yield optimum improvements in terms of friction, wear and PV rating of the resin system. Another important parameter to be taken into account is the thermoplastic processing and service temperatures. High temperatures require good thermal stability.

Polymist® and Algoflon® L PTFE can be incorporated into thermoplastics by pre-mixing or co-feeding with the base polymer using standard industrial equipment and technology. The compound can also be prepared by first using a masterbatch.

Typical properties of recommended grades

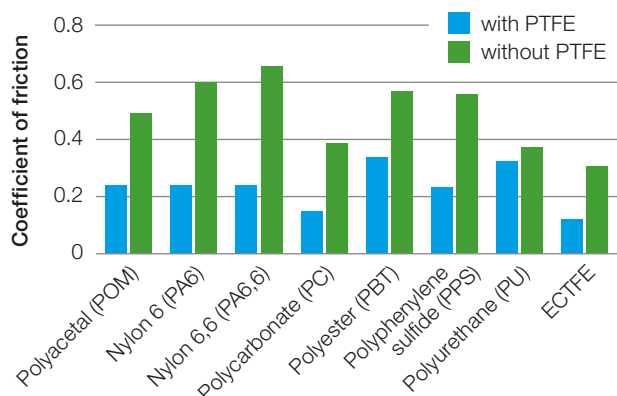
	Application	Particle Size D50 [µm]	Bulk Density [g/L]	Melting Point [°C]	FDA 21 CFR
Polymist® F5 A	Low temperature	4.0	400	325 ± 5	175.300
Polymist® XPP 515	Low temperature	20.0	400	325 ± 5	175.300
Polymist® F5 A EX	Low/high temperature	12.0	500	330 ± 5	175.300
Polymist® F284	High temperature	9.0	400	330 ± 5	175.300 177.1550
Polymist® XPP 511	High temperature	20.0	600	330 ± 5	175.300 177.1550

Wear resistance



Test conditions: $P = 27 \text{ N/cm}^2$, $V = 15 \text{ m/min}$

Coefficient of friction



Thermoplastic resins exhibit significantly improved wear resistance and reduced coefficient of friction when added with PTFE micro-nized powders. This data is representative of typical properties of PTFE filled materials and industry published information.

Elastomers

Elastomeric parts containing Polymist® and Algoflon® L PTFE will exhibit the following application properties:

- Improved lubricity
- Increased (hot) tear strength
- Better flex life
- Reduced friction and wear

Besides its main function as a wear additive, Polymist® and Algoflon® L PTFE can be used at low concentration to improve mold release properties.

Typically 5 to 15 phr can be added to elastomeric compounds to achieve the desired properties.

Polymist® and Algoflon® L PTFE can be used in typical elastomeric applications such as shaft seals, transmission belts, weather strips, gaskets, O-rings and hoses.

Internal or open mixers (e.g. Banbury or two-roll mixers) are normally used to allow a good distribution of Polymist® and Algoflon® L PTFE in the elastomeric compound. Additional fillers are normally included with Polymist® and Algoflon® L PTFE during the blending process. The resulting elastomeric composition can then be processed under normal conditions.

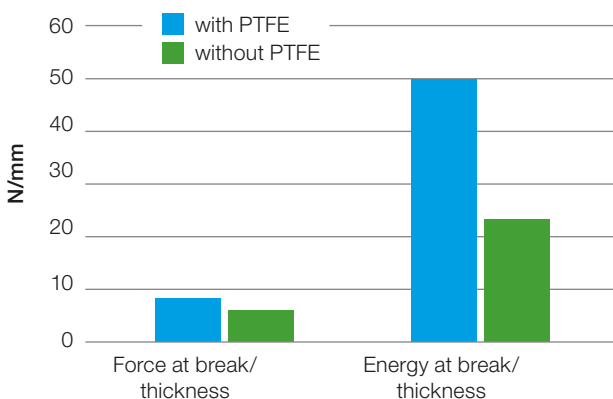


Typical properties of recommended grades

	Application	Surface Area [m ² /g]	Particle Size D50 [µm]	Bulk Density [g/L]	Melting Point [°C]	FDA 21 CFR
Polymist® F5 A	Standard	3.0	4.0	400	325 ± 5	175.300
Polymist® XPP 538	Standard	3.0	4.5	400	325 ± 5	175.300
Polymist® F284	Standard	3.0	9.0	400	330 ± 5	175.300 177.2600
Algoflon® L206	High efficiency	> 7.5	5.0	325	330 ± 5	175.300

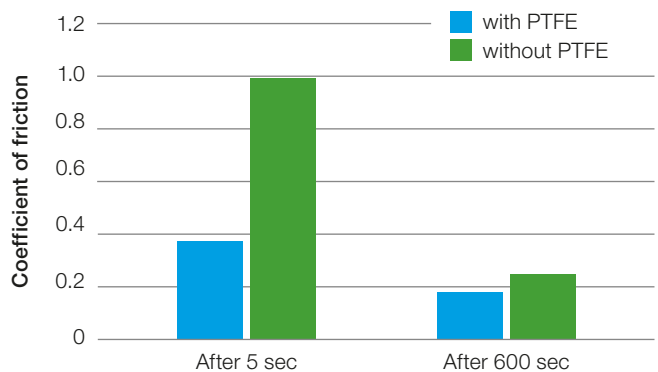
Hot tear resistance of Tecnoflon® FKM

Fluoroelastomer by Solvay Specialty Polymers



Dynamic COF test using Tecnoflon® FKM

Fluoroelastomer by Solvay Specialty Polymers



Test conditions: weight = 20N, speed = 1,000 rpm

Coatings and Paints

Polymist® and Algoflon® L PTFE are used as additives in paints and coatings where improvements in non-stick, mar resistance, slip, chemical resistance, and moisture repelling characteristics are desired.

Polymist® and Algoflon® L PTFE can be used in:

- Cookware/bakeware
- Industrial protective equipment
- Consumer electronics
- Architectural coil
- Metal cans
- Wood and plastic
- Marine paints
- Interior/exterior paints

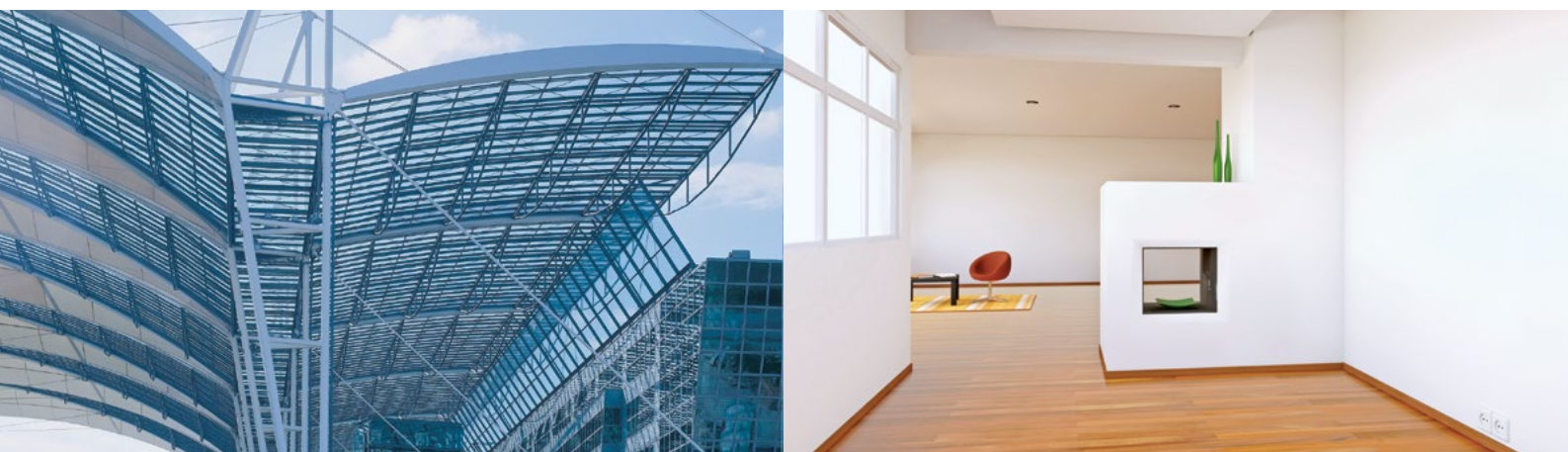
Applications typically require a concentration of 0.5–3.0%. In the case of cookware, higher concentrations may be required.

Polymist® and Algoflon® L PTFE can enhance the properties of coating applications in many different ways in order to provide optimum performance. The average particle size and particle size distribution of the grade used in these applications should be properly selected. This will help ensure the desired surface appearance and characteristics are maintained in the cured coating. The thermal properties of PTFE improve the temperature resistance of the coating and maintain thermal stability during any high temperature curing process.

Polymist® and Algoflon® L PTFE may be used independently as an additive or in combination with polyethylene waxes. The PTFE content at the surface layer is required in order to impart the properties of PTFE to the coating.

Typical properties of recommended grades

	Particle Size D50 [µm]	NPIRI Grind Max. Value	Bulk Density [g/L]	Melting Point [°C]	FDA 21 CFR
Polymist® F5 A	4.0	2.5	400	325±5	175.300
Polymist® XPP 552	3.3	1.5	325	325±5	175.300
Polymist® XPP 535	3.8	2.0	325	325±5	175.300
Polymist® XPP 538	4.5	2.5	400	325±5	175.300
Polymist® F284	9.0	5.0	400	330±5	175.300 177.1550
Algoflon® L206	5.0	1.5	325	330±5	175.300
Algoflon® L600	4.0	1.5	325	325±5	175.300



Inks

Polymist® and Algoflon® L PTFE are highly recommended as additives in ink formulations because they offer a wide range of performance attributes:

- Improved abrasion, scratch and rub resistance
- Increased slip and surface lubricity
- Reduced blocking
- Better chemical resistance
- Increased temperature resistance
- Gloss retention

These products are suitable in formulations for printing processes such as lithography (heat-set and sheet fed), gravure and flexography. Typical loadings are 0.5 to 3 % by weight.

The utilization of Polymist® and Algoflon® L PTFE provide superior printed image protection and easier winding and stacking during the printing process. These grades also enhance productivity by reducing blocking and interference during drying.

These powders can be dispersed easily at room temperature, and they do not agglomerate at temperatures used during formulation or printing. Chemical inertness and improved temperature resistance give ink formulators the opportunity to use a variety of solvents without adverse chemical reactions. Typical average particle size of Polymist® PTFE grades for inks is below 5 microns and control of oversize particles is critical to maintain a high quality printed image.

Typical properties of recommended grades

	Particle Size D50 [µm]	Particle Size D99 [µm]	NPIRI Grind Max. Value	Bulk Density [g/L]	FDA 21 CFR
Polymist® XPP 552	3.3	8	1.5	325	175.300
Polymist® XPP 535	3.8	10	2.0	325	175.300
Polymist® XPP 538	4.5	15	2.5	400	175.300



Lubricants

Polymist® and Algoflon® L PTFE are an ideal additive for lubricants with respect to any other solid additive because they offer:

- Low coefficient of friction and reduced wear
- Outstanding chemical and corrosion resistance
- High temperature resistance
- Good low temperature torque

Polymist® and Algoflon® L PTFE are ideal for dispersing in oils, greases and pastes to improve both high and low temperature lubricity and are preferred over conventional additives, such as graphite or molybdenum disulfide whenever potential staining cannot be tolerated.

Greases incorporating up to 30% by weight of Algoflon® L PTFE are effective for much longer periods than conventional greases so that lubrication frequency may be reduced substantially. Extreme environmental demands on greases, such as those experienced in the automotive industry (i.e. wide temperature ranges and heavy loads) can be accommodated by the addition of Algoflon® L PTFE.

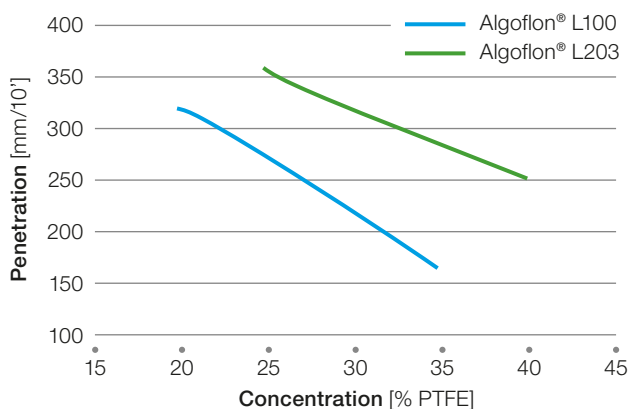
When used as a thickener, high specific surface area is normally preferred. The concentration of Polymist® and Algoflon® L PTFE in high quality greases depend on the SSA of the micronized powder. Grades with higher SSA require less concentration of PTFE micronized powder to achieve the same results in terms of viscosity, consistency, penetration, etc.

Typical properties of recommended grades

	Surface Area [m ² /g]	Particle Size D50 [µm]	Bulk Density [g/L]	Melting Point [°C]	FDA 21 CFR NSF
Polymist® F5 A	3	4.0	400	325±5	175.300 HX-1
Polymist® XPP 515	3	20.0	500	325±5	175.300
Algoflon® L100	> 20	20.0	325	325±5	175.300 177.1550 HX-1
Algoflon® L203	> 7.5	5.0	325	330±5	HX-1
Algoflon® L600	> 7.5	4.0	325	325±5	175.300 HX-1

Penetration vs. SSA and % PTFE

Base oil: Fomblin® PFPE by Solvay Specialty Polymers



Additional Information

The usual precautions for safe storage and handling of Polymist® and Algoflon® L PTFE powders should be taken according to material safety documentation and experience. There will be no chemical deterioration of the Polymist® and Algoflon® L PTFE during proper storage.

Shelf life of Polymist® and Algoflon® L PTFE will vary depending upon whether the recommended storage conditions are maintained and whether the material remains free from foreign contamination during storage time (not exposed to dirt, dust, water or other chemicals). The material should remain sealed in the original

containers and storage conditions should provide for protection from temperature extremes as well as rain, snow or other wet environments (or such conditions which may damage the storage containers in which the product is stored).

For additional information refer to “Guide to the Safe Handling of Fluoropolymers Resins”, published by the Fluoropolymers Division of The Society of the Plastics Industry.

Broadest Portfolio of Specialty Polymers

Advanced Lightweighting Solutions

- TegraLite™ Lightweighting Solutions
 - TegraCore™ PPSU Structural Foam
 - 3D Foams
 - Films
 - Composites
- Solef® 80 000 e-PVDF
- Virantage® PESU Tougheners

Biomaterials for Implantable Devices

- Eviva® PSU
- Veriva® PPSU
- Zeniva® PEEK

Cross-Linkable Compounds

- Cogegum® XLPO-HFFR
- Polidan® PEX/XLPE
- Poldiemme® XLPO

Films

- Ajedium™ Films

Fluorinated Elastomers

- Tecnoflon® FKM/PFR FFKM
 - Base Resistant
 - Ionic Curable
 - Low Temperature
 - Peroxide Curable
 - PFR FFKM Perfluoroelastomers

Fluorinated Fluids

- Fomblin® HC PFPE
- Fomblin® PFPE Lubricants
- Galden® PFPE
- Solvera® PFPE

Fluoropolymers

- Algoflon® PTFE
 - Dispersions
 - Fine Coagulated Powders
 - Granulars
 - Micronized Powders
- Halar® ECTFE
- Hyflon® PFA & MFA®
- Polymist® PTFE Micronized Powders
- Solef® PVDF

Fluoropolymer Coatings

- Halar® ECTFE
- Hyflon® PFA & MFA®
- Hylar® PVDF
- Hylar® 5000 PVDF for Architectural Coatings

Functional Fluids

- Fluorolink® PFPE
- Fomblin® PFPE Functional

Liquid Crystal Polymers

- Xydar® LCP

Polyamide-Imides

- Torlon® PAI

Polyamides, Aromatic

- Amodel® PPA
- Ixef® PARA
- Kalix® HPPA
- Omnix® HPPA

Polyesters, High-Performance

- Lavanta® HPP

Polyketones, Aromatic

- AvaSpire® PAEK
- KetaSpire® PEEK

Polymer Processing Aids

- Solef® 11010 PVDF
- Tecnoflon® NM FKM

Polyphenylene Sulfide

- Ryton® PPS

Polyvinylidene Chloride

- Diofan® PVDC
- Ixan® PVDC Extrusion Resins
- Ixan® PVDC Soluble Powders

Specialty Materials

- Aquivion® PFSA
- Hyflon® AD
- Long Fiber Compounds
- Solvene® EAP
- Torlon® AI for Coatings

Sulfone Polymers

- Acudel® modified PPSU
- Radel® PPSU
- Udel® PSU
- Veradel® PESU



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