INOFLON®
Granular PTFE Resins

GFL™
GUJARAT FLUOROCHEMICALS
VALUE THROUGH GREEN CHEMISTRY

INOFLON® Granular Virgin PTFE Resins

PTFE has an impressive array of following properties that makes it the material of choice for various demanding applications:

- Low di-electric constant and loss factor
- Low coefficient of friction
- Broad range of service temperature (-250°C to 250°C)
- Inherent UV resistance
- Excellent chemical resistance
- Low smoke and flammability resistance
- FDA compliance for food contact

Grades and Applications

Grades	Characteristics	Main Applications
INOFLON® 610/630/640/655 (Low Flow)	• Fine particle size with narrow distribution • High tensile and elongation	• General molding • Skived film and sheet • Compounding
INOFLON® 210/220/230 (Free Flow)	• Good flow • High bulk density • Good mold filling behavior	• Automatic and Isostatic molding of parts • Molded sheets • Small diameter and thin wall thickness tube
INOFLON® 510/515 ((Pre-sintered)	• Narrow particle size distribution • Good flow • Homogeneously sintered powder	• For making continuous profiles (rods and tubes) by RAM extrusion

Typical Properties

Properties	Test Method	Unit	Nominal Value								
			610	630	640	655	210	220	230	510	515
			Low Flow				Free Flow			Pre-sintered	
Bulky Density	ASTM D 4894	g/l	450	350	325	460	700	775	750	500	600
Avg. Particle Size	ASTM D 4894	µm	190	32	23	50	600	500	300	575	150
Mold Shrinkage	ASTM D 4894	%	3.25	3.5	4	3.5	2.50	2.25	2.25	-	-
Powder Flow	ASTM D 1895	g/min	-	-	-	-	400	400	-	300	-
Std. Specific Gravity	ASTM D 4894	-	2.155	2.155	2.155	2.155	2.155	2.155	2.155	2.155	2.155
Melting Points	ASTM D 4894	°C °(F)	342 (648) 327 (621)	342 (648) 321 (621)	342 (648) 321 (621)	342 (648) 327 (621)	342 (648) 327 (621)	342 (648) 327 (621)	342 (648) 327 (621)	327 (621)	327 (621)
Tensile Strength	ASTM D 4894	MPa (Psi)	25 (3626)	30 (4351)	35 (5076)	35 (5076)	30 (4351)	30 (4351)	30 (4351)	20* (2900)*	- -
Elongation	ASTM D 4894	%	250	325	350	325	275	275	275	200*	-

Note: These are typical properties and not to be used for specification purpose
* GFL Internal Method

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INOFLON® Granular Modified PTFE Resins

Modified PTFE is chemically modified and has following improved properties over virgin PTFE:

- Reduced permeability
- Reduced deformation under load
- Good flexural fatigue resistance
- Smooth surface
- Higher transparency
- Weldability
- Higher di-electric strength
- Reduced stretch void index

Grades and Applications

Grades	Characteristics	Main Applications
INOFLON® M690/M695 (Low flow)	• Fine particle size with narrow distribution	• Skived film and sheet • Compounding
INOFLON® M280/M290/ M295 (Free flow)	• Good flow • High bulk density • Good mold filling behavior	• Automatic and Isostatic molding of parts • RAM extrusion of rods and tubes

Typical Properties

Properties	Test Method	Unit	Nominal Value				
			M690	M695	M290	M295	M280
			Low Flow		Free Flow		
Bulky Density	ASTM D 4894	g/l	300	300	700	700	700
Avg. Particle Size	ASTM D 4894	µm	25	25	475	475	500
Mold Shrinkage	ASTM D 4894	%	5	5	4	4	-
Powder Flow	ASTM D 1895	g/min	-	-	400	400	400
Std. Specific Gravity	ASTM D 4894	-	2.155	2.160	2.155	2.160	2.160
Melting Points	ASTM D 4894	°C (°F)	342 (648) 327 (621)	342 (648) 327 (621)	342 (648) 327 (621)	342 (648) 327 (621)	342 (648) 327 (621)
Tensile Strength	ASTM D 4894	MPa (PSI)	30 (4351)	30 (4351)	30 (4351)	30 (4351)	20 (2900)
Elongation	ASTM D 4894	%	400	400	400	400	400

Note: These are typical properties and not to be used for specification purpose

Regulatory Compliances

INOFLON® Granular PTFE when correctly processed, may comply with:

- Food & Drugs Administration (FDA) directive 21 CFR 177.1550
- REACH—Substance of Very High Concern (EC) No. 1907/2006
- EC 10 2011 and hence article 3 of European regulation no. 1935/2004
- REACH—Substances of Very High Concern (EC) No. 1907/2006
- 3-A Sanitary Standard for Multiple—Use Plastic Materials
- RoHS Directive 2011/65/EU
- End of Life Vehicles (ELV) directive 2000/53/EC
- United States Pharmacopoeia (USP) Class VI
- Underwriters Laboratories (UL)—File no. E321158
- DVGW technical standard W270*

(* Applicable to INOFLON® Granular Virgin PTFE only)

Handling and storage of material

Preforming at temperatures in the range of 23-28°C (73.4-82.4°F) is most preferable. Resin temperature must be above 19°C (66.2°F) during moulding because of a special molecular transition of PTFE at 19°C (66.2°F). PTFE molecule, which has a helical shape, tightens up by transition from a helix where 15 carbons are required for 180° turn to 13 carbons. Below 19°C (66.2°F), PTFE molecule becomes stiff and less conformable, thus there is a chance that moulded parts could end up cracked. PTFE powder becomes sticky, forms lumps snd loses all flow at temperatures above 28°C (82.4°F).

For best results, the powder processing areas should be kept clean and free of all contamination. Organic contamination and foreign matter usually appear as dark spots often easily visible against the white PTFE background. Organic contamination material degrades at the sintering temperatures and forms discolored spots. They oxidize away as carbon dioxide wherever sufficient oxygen exposure takes place. It is therefore, not unusual to encounter discoloration inside a part away from the surface where hardly any oxygen is present.

Safety precautions

Handling and processing of PTFE must be done in ventilated areas to prevent personnel exposure to the fumes liberated during sintering and heating of the resin. Fumes should not be inhaled and eye and skin contact must be avoided. In case of skin contact wash with soap and water immediately. In case of eye contact, flush with water immediately and seek medical help. Smoking tobacco or cigarettes contaminated with PTFE may result in a flu-like condition including chills, fever and sore throat that may not occur until a few hours after exposure has taken place. Mixtures of some metal powders such as magnesium or aluminum are flammable and explosive under some conditions. Please read the Material Safety Data Sheet and the detailed information in the "Guide to the safe handling of Fluoropolymer Resins" published by the Fluoropolymer Division of The Society of the Plastics Industry available at www.plasticseurope.org.

INOFLON®
Fine Powder PTFE Resins

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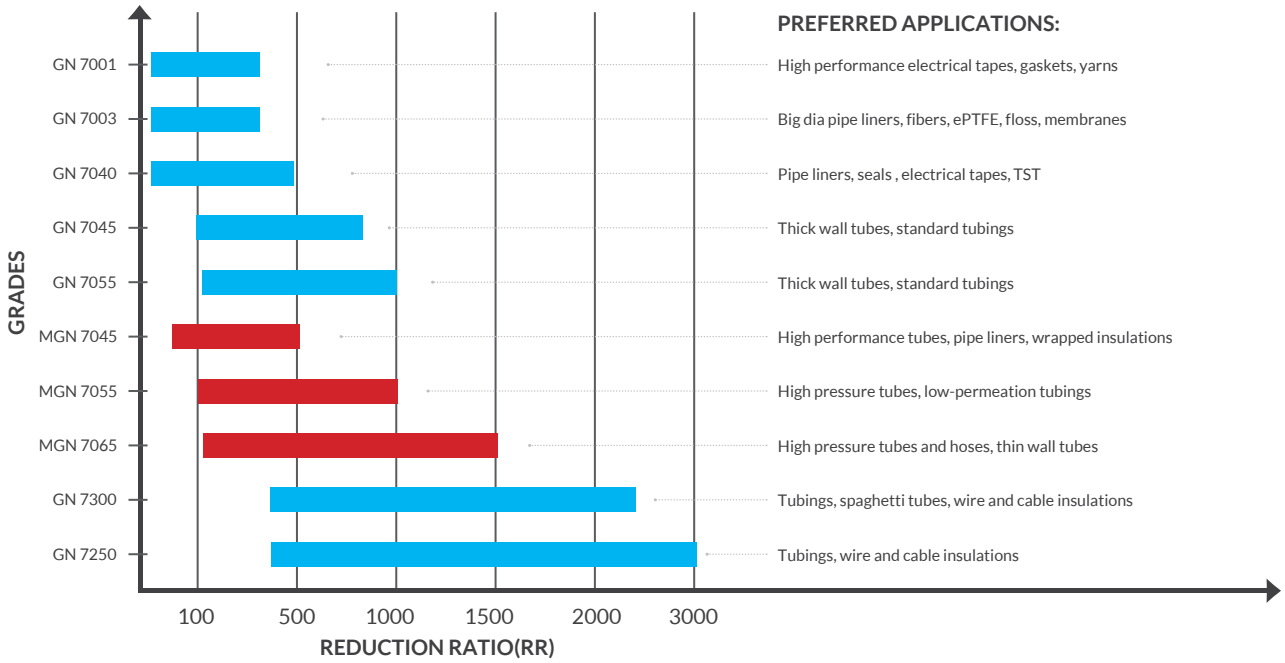
INOFLON® Fine Powder PTFE Resins are polymerized in an aqueous dispersion medium made from environmental friendly emulsifier. INOFLON® Fine Powder PTFE Resins are milky white polymers obtained from coagulating dispersions. Hydrocarbon oils are used for processing Fine Powder PTFE Resins. INOFLON® Fine Powder PTFE resins offer an impressive array of properties that make them the material of choice for various demanding applications.

INOFLON® Fine Powder PTFE Resins are PFOA / PFOS free

INOFLON® Fine Powder Product Portfolio



Important Properties (GN/MGN Grades)

- High dielectric strength
- Good dimensional stability
- Good fibrillation
- Good mechanical properties and ease of processability
- Chemically inert to most industrial chemicals and solvents
- Low friction and non stick surface
- High stress cracking resistance
- Good transparency
- High burst strength
- Good surface finish
- Good weldability
- Low gas permeability
- High flex life

Typical Properties - GN Grades

Properties	Test Method	Unit	Nominal Value						
			GN7001	GN7003	GN7040	GN7045	GN7055	GN7250	GN7300
Bulk density	ASTM D 4895	g/L	475	500	500	475	475	400	450
Avg. particle size (d_{50})	ASTM D 4895	µ m	500	525	525	475	475	500	450
Extrusion pressure [Reduction Ratio]	ASTM D 4895	MPa (psi)	42 (6092) [RR 400:1]	42 (6092) [RR 400:1]	35 (5076) [RR 400:1]	22 (3191) [RR 400:1]	20 (2901) [RR 400:1]	40 (5082) [RR 1600:1]	42 (6092) [RR1600:1]
Std. Specific Gravity (SSG)	ASTM D 4895	-	2.150	2.155	2.175	2.18	2.175	2.185	2.175
Tensile strength	ASTM D 4895	MPa (psi)	32 (4641)	33 (4786)	33 (4786)	33 (4786)	33 (4786)	33 (4786)	33 (4786)
Elongation	ASTM D 4895	%	330	330	330	330	330	330	350

Note - These are typical properties and not to be used for specification purpose

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Typical Properties - MGN Grades

Properties	Test Method	Unit	Nominal Value		
			MGN7045	MGN7055	MGN7065
Bulk density	ASTM D 4895	g/L	500	500	475
Avg. particle size (d_{50})	ASTM D 4895	µ m	500	475	450
Extrusion pressure [Reduction Ratio]	ASTM D 4895	MPa (psi)	29 (4206) [RR 400:1]	22 (3191) [RR 400:1]	45 (6527) [RR 1600:1]
Std. Specific Gravity (SSG)	ASTM D 4895	-	2.149	2.151	2.153
Tensile Strength	ASTM D 4895	MPa (psi)	33 (4786)	33 (4786)	32 (4641)
Elongation	ASTM D 4895	%	330	330	350

Note - These are typical properties and not to be used for specification purpose

Applications

INOFLON® Fine Powder PTFE is processed using paste extrusion technique by mixing resin with suitable extrusion aid (lubricant). Parts made from 'GN' grades include liners, thread seal tapes, electrical tapes, joint sealants, pressure hoses, wires & cables, small diameter thin wall tubings, filter membranes, yarns, fibers, dental floss, etc. Parts made from 'MGN' grades include high performance hoses, wires & cables, small diameter thin wall tubings, flat gaskets, etc.

Regulatory Compliances

- REACH–Substances of Very High Concern (EC) No. 1907/2006
- Food & Drugs Administration (FDA) directive 21 CFR 177.1550
- RoHS Directive 2011/65/EU
- United States Pharmacopoeia (USP) Class VI

Handling and storage of material

PTFE Fine Powder Resins are susceptible to shear damage, particularly above its transition point 19°C (66.2°F). Handling and transportation of the containers could easily subject the powder to sufficient shear to spoil it if the resin temperature is above transition point. To ensure that the resin does not fibrillate, it should be cooled below its transition temperature prior to handling and transportation. A typical packing unit of 25 kg should be cooled for 24–48 hours at less than 15°C (59°F) to assure temperature uniformity throughout the drum. Specially designed shallow cylindrical drums are used to minimize lump formation, compaction, and shearing of the resin. To prevent moisture and contamination, the drum must not be opened where the ambient dew point is above the temperature of resin to avoid immediate condensation on the resin. Storage and handling facilities should be clean. Very small foreign particle are highly visible in the white resin, keep resin drum closed and clean. Good housekeeping and careful handling are essential.

Safety precautions

Handling and processing of PTFE must be done in ventilated areas to prevent personnel exposure to the fumes liberated during sintering and heating of the resin. Fumes should not be inhaled and eye and skin contact must be avoided. In case of skin contact wash with soap and water immediately. In case of eye contact, flush with water immediately and seek medical help. Smoking tobacco or cigarettes contaminated with PTFE may result in a flu-like condition including chills, fever and sore throat that may not occur until a few hours after exposure has taken place. Mixtures of some metal powders such as magnesium or aluminum are flammable and explosive under some conditions. Please read the Material Safety Data Sheet and the detailed information in the "Guide to the safe handling of Fluoropolymer Resins" published by the Fluoropolymer Division of The Society of the Plastics Industry available at www.plasticseurope.org

INOFLON®
Aqueous PTFE Dispersions

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INOFLON® Fluoropolymer Dispersions

INOFLON® fluoropolymer dispersions are polymerized in an aqueous dispersion medium, made from environmental friendly emulsifier and consists of very small particles of fluoropolymer resin. The dispersions are stabilized in water by non-ionic surfactants. All INOFLON® fluoropolymer dispersions are PFOA free. INOFLON® fluoropolymer dispersions offer an impressive array of following properties that makes them the material of choice for various demanding applications:

- Good film forming properties
- Good wetting
- Good chemical resistance
- Very good abrasion resistance
- Very good adhesion
- High gloss
- Non-stick properties

Aqueous Dispersion PTFE
Grades, Characteristics & Applications:

Grade	Characteristics	Main Applications
AD 9100	Good Wetting Properties Good Penetration Properties Good Weatherability	Belting ,Architectural Fabric & Gaskets, Packing Seals & Gaskets, Industrial Fabric, Yarns & Filter Cloth
AD 9200	High Gloss Very Good Abrasion Resistance Good Corrosion Resistance High Shear Stability	Formulations of High Performance Cookware and Industrial Coating
AD 9300	Good Impregnation Low Foaming Good Weatherability	Architectural Fabric & Gaskets, Packing Seals & Gaskets, Industrial Fabric,Yams & Filter Cloth, Anti Dripping & Impregnation of Graphite Block
AD 9400	High Critical Cracking Thickness Very Good Abrasion Corrosion Resistance	Metal Coating Formulation, Glass Cloth Coating
AD 9700	Good Chemical Resistance High Heat Resistance	Bearing & Seals

INOFLON®
Aqueous PTFE Dispersions

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Typical Properties

SL. No	Properties	Unit	Test Method	INFLON® AD9100	INFLON® AD9200	INFLON® AD9300	INFLON® AD9360	INFLON® AD9400	INFLON® AD9700
1	Solid Content	%	ASTM D-4441	60	60	60	60	60	24 ± 2
2	Surfactant Content	%	ASTM D-4441	7.5	6	6	4.5	6	5
3	pH	-	ASTM E-70	>9.5	>9.5	>9.5	>9.5	>9.5	>9.5
4	Particle Size	nm	Internal	230	220	230	230	220	220
5	Specific Gravity	-	ASTM D-4441	1.51	1.51	1.51	1.51	1.51	1.15

Bimodal & LMD (Low Molecular Weight Dispersion) Aqueous Dispersion PTFE
Grades, Characteristics &Applications:

Grade	Characteristics	Main Applications
AD 9210	Excellent Wetting Properties Very High Gloss Excellent Penetration Properties Bimodal Particle Size Distribution	Belting ,Architectural Fabric & Gaskets, Packing Seals & Gaskets, Industrial Fabric, Yarns & Filter Cloth
AD9310	Excellent wetting properties Excellent Chemical Resistance Good weatherablity High gloss	Architectural Fabric & Gaskets, Industrial Fabrics, Yarns, Anti Dripping & Impregnation of Graphite Block.
AD 9410	High Gloss Low Porosity High Critical Cracking Thickness Bimodal Particle Size Distribution	Formulations of High Performance Cookware and Industrial Coating
LMD 7900	High Gloss Low Molecular Weight Dispersion Excellent Penetration Resistance to Wear and Corrosion	Additive in Coatings, Polymers, Paints, Inks and Composites.

Typical Properties:

SL.No	Properties	Unit	Test Method	INOFLON® AD 9210	INOFLON® AD 9310	INOFLON® AD 9410	INOFLON® LMD 7900
1	Solid Content	%	ASTM D-4441	60	60	60	50
2	Surfactant Content	%	ASTM D-4441	8	6.5	6	7
3	pH	-	ASTM E-70	>9.5	>9.5	>9.5	>9.5
4	Particle Size	nm	Internal	205	205	205	160
5	Specific Gravity	-	ASTM D-4441	1.51	1.51	1.51	1.40

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Aqueous PTFE Dispersions

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FEP & PFA Dispersions

Grades, Characteristics & Applications:

Grade	Characteristics	Main Applications
PFA 8900	High Gloss Good Weldability Low Abrasion High MFR	Formulation of High Performance Non-Stick Coatings and Impregnation of Woven Packing, Yarn & Glass Fabric in Combination with PTFE Dispersions.
PFA 8910	High Gloss Good Weldability Excellent Dielectric Properties & Low MFR	Formulation of High Performance Non-Stick Coatings and Impregnation of Woven Packing, Yarn & Glass Fabric in Combination with PTFE Dispersions.
FEP 4910	Excellent Shear Stability Good Wetting Properties Excellent Weatherability Low Settling Tendency	Formulation of High Performance Non-Stick Coatings and Impregnation of Woven Packing, Yarn & Glass Fabric

Typical Properties

SL.No	Properties	Unit	Test Method	INFLON® PFA 8900	INFLON® PFA 8910	INFLON® FEP 4910
1	Solid Content	%	ASTM D-4441	50	60	55
2	Surfactant Content	%	ASTM D-4441	6	6	7
3	pH	-	ASTM E-70	>9.5	>9.5	>9.5
4	Particle Size	nm	Internal	170	170	170
6	Specific Gravity	-	ASTM D-4441	1.40	1.50	1.45
7	Melt Flow Rate	g/10 min	ASTM D-1238	15	2	10

Regulatory compliances

INOFLON® fluoropolymer dispersion complies with

- Food & Drugs Administration (FDA) directive 21 CFR 177.1550.
- EC 10 2011 and hence article 3 of European regulation no. 1935/2004 and German Food Articles of daily use and Feed code of September 1, 2005 (LFGB), Section 30, BFR recommendation

Packaging

INOFLON® fluoropolymer dispersion grades are available in 30 litres (8 gal) plastic drums and 1000 litres (263 gal) IBC recyclable containers.

Handling and Storage of material

- The working site must be clean to ensure fine appearance of final products.
- Aqueous dispersions should be stored at temperatures between 10°C to 25°C.
- It should be homogenized by gentle stirring after every 2 weeks & before use.
- Filtration: Prior to application of the dispersions. Filtration with 50-100 micron Nylon fabric is recommended.
- Shelf life of INOFLON® Fluoropolymer Dispersion is one year from the date of manufacturing.

Safety Precautions

Handling and processing of Fluoropolymer must be done in ventilated area to prevent personnel exposure to the fumes liberated during sintering and heating of the resin. Fumes must not be inhaled and eye and skin contact should be avoided. In case of eye contact flush, water immediately and seek medical help. Smoking Tobacco and cigarettes contaminated with Fluoropolymer may result in a flulike condition including chills, fever and sore throat that may not start until a few hours after exposure has taken place. These symptoms usually pass within about 24 hours. Vapors and gases generated during sintering of Fluoropolymer must be completely removed from the factory areas. Mixtures of some metal powder such as magnesium or aluminum are flammable and explosive under some conditions. Please read the Material Safety Data Sheet and the detailed information in the "Guide to the Safe Handling of Fluoropolymer Resins" published by the Fluoropolymer division by the Society of the Plastic Industries available at **www.plasticseurope.org**