



## TTFEP15Foam

### FEP Extrusion Resin with Nucleating Agent

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#### Description

**TTFEP15Foam** is a fluoroplastic resin compounded with a foam nucleating package. This resin is supplied as white pellets and is used in a nitrogen gas-injected foam extrusion process to produce uniform foam cells in the dielectric insulation.

#### Application

**TTFEP15Foam** is ideal for producing coaxial cable cores in a broad range of sizes. Foaming the fluoroplastic reduces its dielectric constant, providing opportunities for miniaturization and weight savings. Foamed insulation of **TTFEP15Foam** produces cables for high frequency signal transmission with minimal distortion. Void content will vary from 20% to 60%. Achievable void content will vary based on wall thickness and processing conditions.

#### Safety Precautions

Before processing any fluoroplastics, read the Safety Data Sheet available upon request. Also read the detailed information in the latest edition of the "Guide to the Safe Handling of Fluoropolymer Resins" published by the Fluoropolymers Division of the Plastics Industry Association ([www.plasticsindustry.org/supply-chain/material-suppliers/fluoropolymers-division](http://www.plasticsindustry.org/supply-chain/material-suppliers/fluoropolymers-division)).

Open and use containers only in well ventilated areas using local exhaust ventilation. Vapors and fumes liberated during hot processing of **TTFEP15Foam** should be exhausted completely from the work area. Contamination of tobacco with these polymers should be avoided. Vapors and fumes liberated during hot processing that are not properly exhausted, or from smoking tobacco or cigarettes contaminated with **TTFEP15Foam** may cause flu-like symptoms, such as chills, fever, and sore throat. This may not occur until several hours after exposure and will typically pass within about 24 hours.

#### Storage and Handling

The properties of **TTFEP15Foam** are not affected by storage time. Ambient storage conditions should be free of airborne contamination and water condensation when opening and emptying the package.

<b>Physical Properties</b>	<b>Typical Value</b> <sup>(2)</sup>	<b>Unit</b>	<b>Test Method</b> <sup>(1)</sup>
Specific Gravity	2.14		ASTM D 792
Melting Point	260	° C	ASTM D 4591
Melt Flow rate (372° C, 5 kgs)	14.0	(g/10 min)	ASTM D 2116
<b>Electrical Properties</b>	<b>Typical Value</b> <sup>(2)</sup>	<b>Unit</b>	<b>Test Method</b> <sup>(1)</sup>
Dielectric Constant (1 kHz)	2.04	-	ASTM D 150
Dielectric Constant (1 MHz)	2.04		ASTM D 150
Dielectric Constant (1GHz)	2.04		ASTM D 2520
Dissipation Factor (1 kHz)	0.0001	-	ASTM D 150
Dissipation Factor (1 MHz)	0.0006		ASTM D 150
Dissipation Factor (1 GHz)	0.0008		ASTM D 2520

(1) Tested in accordance with the latest issue of the designated Test Methods.

(2) Data represents typical values and should not be used for specification work.

## General Processing Guidelines

**TTFEP15Foam** can be fed directly to a conventional single-screw extruder with nitrogen gas injection. The extrusion and tooling used for **TTFEP15Foam** should be constructed of high nickel alloy corrosion-resistant materials and capable of operating at temperatures up to 400°C (750°F). The process should include devices to monitor diameter, capacitance, and gas flow. Insulation performance is determined by extruder output, wire line speed, and void content. Void content is controlled by nitrogen flow rate, process temperatures and quench point. It is best for the voids to grow after the melt is drawn down onto the wire. Elongated voids in the insulation indicate early growth of the cells in the draw-down cone. TTFEP15FOAM is typically applied as a wire insulation using tubing techniques and Draw-Down Ratios (DDR) generally ranging from 5:1 to 30:1. Higher DDRs usually allow for greater line speed. A draw-ratio balance (DRB) ranging from 1.02 to 1.10 is recommended. A controlled vacuum is required at the rear of the crosshead to adjust the melt cone to the desired length. A melt cone that is too long results in excessive variations while a melt cone that is too short result in excessive spark failures and cone breaks. An electric wire preheater located as close to the crosshead as possible is recommended for preheating the wire. Although the amount of preheat will depend on the application. The coated wire should pass through an air gap followed by a warm-water quench at (110 °F to 150 °F) to allow uniform cooling. The cooling is highly dependent on the thickness of the insulation.

Color Concentrates: FEP based on color concentrates are commercially available from several manufacturers. Your M. Holland representative can recommend AG 9400 color concentrates for your application.

## Typical Temperature Profile for Extruding TTFEP15FOAM

	°C	°F
Z1	357	675
Z2	368	695
Z3	368	695
Z4	368	695
Z5	368	695
Clamp	374	705
Adapter	374	705
Head	374	705
Melt	374	705

1 Based on a 60 mm extruder with a 30:1 L/D; adjustments may be needed for other equipment.

2 For a smaller machine, it will be necessary to raise the temperature to ensure that the resin is completely melted before entry into the extruder's transition zone. A surging output at the idle could be caused by incomplete melting. The above recommendations are general recommendations and modifications for individual machines and run conditions might be necessary.

3 Process temperatures should be below 395° C to avoid any emission of toxic gas.

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## Package and Transportation

**TTFEP15Foam** is packed net 25 kgs drums with quality certificate and lot number. **TTFEP15Foam** can be transported as a non-dangerous product.

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