



## TTFEP20FC

### FEP Nucleating Agent Concentrate

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#### Description

**TTFEP20FC** is a fluoroplastic resin concentrate based on FEP resin containing a well dispersed nucleating agent that acts as a site for foaming during the gas injection extrusion process. This concentrate is supplied in cylindrical pellet form and is used in a nitrogen gas-injected foam extrusion process to produce uniform foam cells in the dielectric insulation. The pellets are approximately 0.125" long by 0.080" diameter. **TTFEP20FC** is added to TTFEP6 and TTFEP20 at addition rates ranging from 5 to 10% depending on particular customer applications and processing conditions.

#### Application

**TTFEP20FC** 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 FEP insulation 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 FEP 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 **TTFEP20FC** 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 **TTFEP20FC** are not affected by storage time. Ambient storage conditions should be free of airborne contamination and water condensation when opening and emptying the package.

| Physical Properties           | Typical Value <sup>(2)</sup> | Unit       | Test Method <sup>(1)</sup> |
|-------------------------------|------------------------------|------------|----------------------------|
| Specific Gravity              | 2.14                         |            | ASTM D 792                 |
| Melting Point                 | 260                          | °C         | ASTM D 4591                |
| Melt Flow rate (372°C, 5 kgs) | 8.40                         | (g/10 min) | ASTM D 2116                |

## General Processing Guidelines

**TTFEP20FC** should be blended 5 to 10% with TTFEP6 or TTFEP20 and then fed directly to a conventional single- screw extruder with nitrogen gas injection. The extrusion and tooling 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 to the wire. Elongated voids in the insulation indicate early growth of the cells in the draw-down cone. Foamed FEP insulation 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 Foamed FEP

|         | °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.

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

The above recommendations are general recommendations and modifications for individual machines and run conditions might be necessary.

## Package and Transportation

**TTFEP20FC** is packed net 25 kgs drums with quality certificate and lot number. **TTFEP20FC** can be transported as a non-dangerous product.

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