



**Novec™**

Brand

# 3M™ Novec™ 1702 Electronic Grade Coating

## Introduction

3M™ Novec™ 1702 Electronic Grade Coating is a single component fluorinated polymer diluted in 3M™ Novec™ 7100DL Engineered Fluid, a segregated hydrofluoroether solvent, providing a low viscosity, low surface tension coating solution. A lower solids content version of 3M™ Novec™ 1700 coating, it dries to an even thinner film and coats under low stand-off components. Designed for moisture and corrosion protection of printed circuit boards and electronic components, it dries to an ultrathin, transparent coating with excellent hydrophobic and oleophobic properties. It does not need curing and is easy to apply. Novec 1702 coating is nonflammable, non-ozone-depleting, low in toxicity, low in GWP, RoHS compliant and VOC exempt (per the U.S. EPA).\*

## Construction

Solids	Solvent	Color	Container Size
0.2 wt% fluorinated polymer	3M™ Novec™ 7100DL Engineered Fluid	Clear	1 gal (11 lb./5kg)

## Table 1: Typical physical properties

Not for specification purposes. All values @ 25°C (73.4°F) unless otherwise specified.

Properties	Coating Solution
Appearance	Clear, colorless liquid solution
Solids	0.2 wt% fluorinated polymer
Solvent	3M™ Novec™ 7100DL Engineered Fluid
Density	1.5 g/ml @ 23°C (73.4°F)
Viscosity	0.63 cP
Boiling Point per ASTM D1120-94	61°C (142°F)
Flash Point	None (per closed cup method)
Environmental	Low in toxicity, low in GWP, non-ozone depleting, non-flammable, VOC exempt (per the U.S. EPA),* RoHS compliant, contains no chlorine or bromine
Shelf Life	Four years from date of manufacture in original unopened package

\*The U.S. EPA defines a VOC as “any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate, which participates in atmospheric photochemical reactions, except those designated by the EPA as having negligible photochemical reactivity.” This product is VOC exempt per the U.S. EPA.

## Table 2: Typical physical properties

Not for specification purposes. All values @ 25°C unless otherwise specified.

Properties	Fluorinated Polymer Coating
Appearance	Transparent, colorless
Coating Thickness	<100 nm (depending on application method)
Solvent and Chemical Resistance	Resists a variety of solvents and chemicals. Dissolves in acetone.
Tg (Glass Transition Temperature)	44°C (112°F)
Thermal Stability of Dry Film MIL-B-81744A	Repellent to chlorinated silicone oil after 24 hours at 175°C (347°F)
Contact Angles (Static, Dip Coated/Dried on Glass Substrate)	105° (water), 65° (hexadecane)
Refractive Index	1.39
Solder-Through Repairability	Yes (see SDS for thermal decomposition products)
Non-Flammable	Meets UL 94 V-0
Coefficient of Thermal Expansion - TMA	70 $\mu\text{m}/(\text{m}\cdot^\circ\text{C})$
Thermal Conductivity	0.1 W/m $\cdot$ K
Dielectric Constant @30% RH per ASTM D150	3.2 (@1kHz)
Dissipation Factor @30% RH per ASTM D150	0.002 (@1kHz)
Dielectric Breakdown Strength @20°C, 30% RH per ASTM D149	2000 V/mil

\*Measured contact angles can vary based on the type of surface, surface roughness and the application method.

## Features

- Designed for moisture and corrosion protection of printed circuit boards and electronic components
- Low surface energy allows lubricating oils, silicones, photoresist solutions, etc. to bead and drain freely from coated surfaces
- Helps provide repellency and anti-wetting properties against liquids – water, hydrocarbons, silicones and photoresists
- Helps protect against corrosive gases and vapors in addition to liquids
- The polymer can endure up to 175°C (347°F) for 24 hours and maintain repellency
- Essentially insoluble in solvents such as heptanes, toluene and water
- Adheres to a variety of materials (metals, glass, ceramics, polymers, composites, laminates)
- Thermally and electrically stable with good dielectric properties
- Easy to apply – dries quickly without the need for post-application curing
- Excellent surface wetting, especially under low standoff SMT components
- Allows solder-through repairability
- Non-flammable, non-ozone-depleting, and low in toxicity
- Low in global warming potential (GWP), RoHS compliant and volatile organic compound (VOC) exempt (per the U.S. EPA)\*

## Applications

Helps provide:

- Moisture, chemical and corrosion protection for printed circuit boards and their components
- An easy and cost-effective alternative to conformal coatings
- Anti-wetting, anti-stiction, anti-migration and anti-corrosion properties in many diverse applications

Can serve as:

- Anti-migration coating for displays, spindle motors or lubricated electronic parts
- Anti-corrosion coating for a variety of materials and components

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## Application techniques

Coating can be applied by spray, dip, brush or selectively deposited as per the safety and handling requirements stated in the Safety Data Sheet (SDS). Water should be kept out of coating bath as contact will interfere with coating deposition. Surfaces to be coated should be clean and dry before application. Masking may not be required for larger connector types, but testing is always suggested. The solvent will evaporate quickly, and the fluorinated polymer film will dry in minutes.

Application Options	Dip, brush and selective dispense
Dilution	Can be diluted with 3M™ Novec™ 7100DL Engineered Fluid
Drying/Curing	Dries at room temperature; can be handled in under two minutes
Removability	3M™ Novec™ 72DA Engineered Fluid (preferred) or removable with Novec 7100DL Engineered Fluid

## Safety, handling, storage and shelf life

To avoid thermal decomposition, the coating solution should not be heated above 150°C (302°F), and the dried fluorinated polymer should not be heated to temperatures above 225°C (437°F); which, in general, is lower than the onset of thermal degradation under TGA test conditions. See SDS for thermal degradation products. When stored under conditions of 16-27°C (60-80°F) and less than 60% R.H. in the original, unopened container, the shelf life is certified for two years. Before using this product, please read the current product Safety Data Sheet (available through your 3M sales or technical service representative or at [www.3M.com/Novec](http://www.3M.com/Novec)) and the precautionary statement on the product package. Follow all applicable precautions and directions. Always practice smart and safe industrial hygiene practices. Do not spray apply without proper ventilation and/or personal protective equipment (PPE).

## Resources

For more information on 3M™ Novec™ products or to contact a 3M representative, visit [3M.com/Novec](http://3M.com/Novec).

**Smart. Safe. Sustainable.**

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## The 3M™ Novec™ Brand Family

The Novec brand is the hallmark for a variety of proprietary 3M products. Although each has its own unique formula and performance properties, all Novec products are designed in common to address the need for smart, safe and sustainable solutions in industry-specific applications. These include precision and electronics cleaning, heat transfer, fire protection, protective coatings, immersion cooling, advanced insulation media replacement solutions and several specialty chemical applications.

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3M™ Novec™ Engineered Fluids • 3M™ Novec™ Aerosol Cleaners • 3M™ Novec™ 1230 Fire Protection Fluid • 3M™ Novec™ Electronic Grade Coatings • 3M™ Novec™ Electronic Surfactants • 3M™ Novec™ Insulating Gases

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**Safety Data Sheet:** Consult Safety Data Sheet before use.

**Regulatory:** For regulatory information about this product, contact your 3M representative.

**Technical Information:** The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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