Material Safety Data Sheet

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: HFE-7200 3M (TM) Novec (TM) Engineered Fluid
MANUFACTURER: 3M
DIVISION: Electronics Markets Materials Division

ADDRESS: 3M Center
St. Paul, MN 55144-1000

EMERGENCY PHONE: 1-800-364-3577 or (651) 737-6501 (24 hours)

Issue Date: 10/06/2004
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Product Use:

Intended Use:	FOR INDUSTRIAL USE ONLY. NOT INTENDED FOR USE AS A MEDICAL DEVICE OR DRUG.
Specific Use:	Solvent for Cleaning and Coating; Heat Transfer Fluid

SECTION 2: INGREDIENTS

Ingredient	C.A.S. No.	% by Wt
ETHYL NONAFLUOROISOBUTYL ETHER	163702-06-5	20 - 80
ETHYL NONAFLUOROBUTYL ETHER	163702-05-4	20 - 80

SECTION 3: HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Specific Physical Form: liquid
Odor, Color, Grade: Clear, colorless liquid. Faint odor.
General Physical Form: Liquid
Immediate health, physical, and environmental hazards:

3.2 POTENTIAL HEALTH EFFECTS

Eye Contact:
Contact with the eyes during product use is not expected to result in significant irritation.

Skin Contact:
Contact with the skin during product use is not expected to result in significant irritation.

Inhalation:
Vapors from heated material may cause irritation of the respiratory system. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

If thermal decomposition occurs:
May be harmful if inhaled.

Ingestion:
No health effects are expected.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

A 3M Product Environmental Data Sheet (PED) is available.
This substance has chemical moieties that are resistant to biodegradation and is likely to only undergo partial biodegradation in the environment. The high potential of this substance to move from water to the atmosphere means its potential to bioconcentrate is likely to disappear rapidly from aerobic environments. Take precautions to prevent direct release of this substance to the environment. AQUATIC TOXICITY: Testing results indicate that this product has insignificant toxicity to aquatic organisms at its saturation point (Lowest LC50,EC50, IC50 > substance water solubility). (June 1997): Fathead Minnow (Pimephales promelas) 96-hr LC50: >750 mg/L NOTE: This data reflects the CA method which was used to satisfy the California (CA) Title 22 Hazard Evaluation Bioassay. This substance is highly volatile and has a high Henry's Law constant and is thus expected to move rapidly through vaporization from solution in an aquatic compartment or from a soil surface in a terrestrial compartment to the atmosphere.

ATMOSPHERIC FATE: Zero Ozone Depletion Potential (ODP). Atmospheric lifetime: approximately 0.8 yrs. Global Warming Potential (GWP): 50 (100-yr ITH, IPCC1995 method). Global Warming Potential (GWP): 55 (100-yr ITH, IPCC2001 method). Atmospheric degradation products are expected to include: for ethyl nonfluoroisobutyl ether: predominantly isoperfluorobutyric acid, CO2, HF, and perhaps also CF3COOH; for ethyl nonfluorobutyl ether: n-perfluorobutyric acid, CO2, and HF.

SECTION 4: FIRST AID MEASURES

4.1 FIRST AID PROCEDURES

The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.

Eye Contact: Flush eyes with large amounts of water. If signs/symptoms persist, get medical attention.

Skin Contact: Wash affected area with soap and water. If signs/symptoms develop, get medical attention.

Inhalation: If signs/symptoms develop, remove person to fresh air. If signs/symptoms persist, get medical attention.

If Swallowed: If signs/symptoms develop, get medical attention. No need for first aid is anticipated.

4.2 NOTE TO PHYSICIANS

Exposures resulting from intentional misuse and abuse may cause.an increase in myocardial irritability. Do not administer sympathomimetic drugs unless absolutely necessary.

SECTION 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

Autoignition temperature	375 ºC [*Details:* ASTM E659-78 Method]
Flash Point	*Not Applicable*
Flammable Limits - LEL	210 g/m3 [*Details:* ASTM E681-94 Method]
Flammable Limits - UEL	1070 g/m3 [*Details:* ASTM E681-94 Method]

5.2 EXTINGUISHING MEDIA

Material will not burn.

5.3 PROTECTION OF FIRE FIGHTERS

Special Fire Fighting Procedures: Exposure to extreme heat can give rise to thermal decomposition. Wear full protective equipment (Bunker Gear) and a self-contained breathing apparatus (SCBA).

Unusual Fire and Explosion Hazards: No unusual fire or explosion hazards are anticipated. No unusual effects are anticipated during fire extinguishing operations. Avoid breathing the products and substances that may result from the thermal decomposition of the product or the other substances in the fire zone. Keep containers cool with water spray when exposed to fire to avoid rupture.

Note: See STABILITY AND REACTIVITY (SECTION 10) for hazardous combustion and thermal decomposition information.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Accidental Release Measures: Observe precautions from other sections. Call 3M- HELPS line (1-800-364-3577) for more information on handling and managing the spill. Ventilate the area with fresh air. Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Collect as much of the spilled material as possible. Clean up residue with an appropriate organic solvent. Read and follow safety precautions on the solvent label and MSDS. Collect the resulting residue containing solution. Place in a metal container approved for transportation by appropriate authorities. Seal the container. Dispose of collected material as soon as possible.

In the event of a release of this material, the user should determine if the release qualifies as reportable according to local, state, and federal regulations.

SECTION 7: HANDLING AND STORAGE

7.1 HANDLING

For industrial or professional use only. No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of the hazardous decomposition products mentioned in the Reactivity Data section of this MSDS. Store work clothes separately from other clothing, food and tobacco products. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment. Avoid continuous exposure of the material to extreme condidtions of heat, i.e., above 150C (welding, open flame, misuse or equipment failure). Avoid exceeding a watt density of 50 watts/inch2 from a heater surface.

Continuous exposure to 150C results in a very slight decomposition of this product and, therefore, is a very conservative use temperature threshold. Applications involving exposure of the fluid to temperatures exceeding 150C should be reviewed with 3M Technical Service.

7.2 STORAGE

Keep container tightly closed. Keep container in well-ventilated area. Store away from heat. Store away from strong bases.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 ENGINEERING CONTROLS

Provide appropriate local exhaust when product is heated. Provide appropriate local exhaust ventilation on open containers. For those situations where the fluid might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines. Provide local exhaust ventilation at transfer points.

8.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

8.2.1 Eye/Face Protection

Avoid eye contact.
The following eye protection(s) are recommended: Safety Glasses with side shields.

8.2.2 Skin Protection

Avoid skin contact with hot material. Wear appropriate gloves, such as Nomex, when handling this material to prevent thermal burns.

Select and use gloves and/or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible materials.
Gloves made from the following material(s) are recommended: Nitrile Rubber.

8.2.3 Respiratory Protection

Avoid breathing of vapors, mists or spray. Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection.
Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations: Half facepiece or fullface air-purifying respirator with organic vapor cartridges. Consult the current 3M Respiratory Selection Guide for additional information or call 1-800-243-4630 for 3M technical assistance. If thermal decomposition occurs, use a fullface supplied-air respirator.

8.2.4 Prevention of Swallowing

Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water.

8.3 EXPOSURE GUIDELINES

Ingredient	Authority	Type	Limit	Additional Information
ETHYL NONAFLUOROBUTYL ETHER	3M	TWA, as total isomers	200 ppm	
ETHYL NONAFLUOROISOBUTYL ETHER	3M	TWA, as total isomers	200 ppm	

SOURCE OF EXPOSURE LIMIT DATA:
ACGIH: American Conference of Governmental Industrial Hygienists
CMRG: Chemical Manufacturer Recommended Guideline
OSHA: Occupational Safety and Health Administration
AIHA: American Industrial Hygiene Association Workplace Environmental Exposure Level (WEEL)

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Specific Physical Form:	liquid
Odor, Color, Grade:	Clear, colorless liquid. Faint odor.
General Physical Form:	Liquid
Autoignition temperature	375 ºC [*Details:* ASTM E659-78 Method]
Flash Point	*Not Applicable*
Flammable Limits - LEL	210 g/m3 [*Details:* ASTM E681-94 Method]
Flammable Limits - UEL	1070 g/m3 [*Details:* ASTM E681-94 Method]
Boiling point	76 ºC
Density	1.43 g/ml
Vapor Density	Approximately 9.1 [*Ref Std:* AIR=1]
Vapor Pressure	109 mmHg [@ 25 ºC]
Specific Gravity	1.43 [*Ref Std:* WATER=1]
pH	*Not Applicable*
Melting point	-138 ºC
Solubility In Water	[*Details:* Insoluble]
Evaporation rate	33 [*Ref Std:* BUOAC=1]
Volatile Organic Compounds	[*Details:* Exempt]
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	[*Details:* Exempt]
Viscosity	0.43 centistoke

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable.

Materials and Conditions to Avoid: Strong bases

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition or By-Products

Substance	Condition
Hydrogen Fluoride	At Elevated Temperatures - extreme conditions of heat
Perfluoroisobutylene (PFIB)	At Elevated Temperatures - extreme conditions of heat

Hazardous Decomposition: Perfluorinated Acid Fluorides

Hydrogen Fluoride has an ACGIH Threshold Limit Value of 3 parts per million (as fluoride) as a Ceiling Limit and an OSHA PEL of 3 ppm of fluoride as an eight hour Time_Weighted Average and 6 ppm of fluoride as a Short Term Exposure Limit. The odor threshold for HF is 0.04 ppm, providing good warning properties for exposure.

Decomposition of this product at temperatures above 300 degrees C can form perfluoroisobutylene (PFIB), but PFIB will only accumulate with continuous exposure to excessive heat in a sealed vessel. The formation rate for PFIB is about 1000 times less than the rate for primary thermal decomposition products such as HF. During normal use conditions, no health hazard is associated with

the use of this material due to PFIB exposure.

SECTION 11: TOXICOLOGICAL INFORMATION

Product-Based Toxicology Information:

For a mixture of ethyl nonafluorobutyl ether and its isomer, a single positive response for cardiac sensitization was observed at an exposure level of 49,000 ppm. No adverse health effects are anticipated from normal handling and use.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION

Test Organism	Test Type	Result
Water flea, Daphnia magna	48 hours Effect Concentration 50%	>2.55 mg/l
Fathead Minnow, Pimephales promelas	96 hours Lethal Concentration 50%	>2.75 mg/l
Green algae, Selenastrum capricornutum	96 hours Effect Concentration 50%	>2.32 mg/l

CHEMICAL FATE INFORMATION

Test Type	Result	Protocol
28 days Biological Oxygen Demand	Nil	

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Reclaim if feasible. As a disposal alternative, incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF. Facility must be capable of handling halogenated materials.

To reclaim or return, check product label for contact.

EPA Hazardous Waste Number (RCRA): Not regulated

Since regulations vary, consult applicable regulations or authorities before disposal.

SECTION 14:TRANSPORT INFORMATION

ID Number(s):
98-0211-9362-2, 98-0211-9363-0, 98-0211-9364-8, 98-0211-9365-5, 98-0211-9366-3, 98-0211-9367-1, 98-0211-9368-9, 98-0211-9369-7, 98-0212-3147-1, 98-0212-3148-9, 98-0212-3149-7, 98-0212-3256-0

Please contact the emergency numbers listed on the first page of the MSDS for Transportation Information for this material.

SECTION 15: REGULATORY INFORMATION

US FEDERAL REGULATIONS

Contact 3M for more information.

311/312 Hazard Categories:

Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No Immediate Hazard - No Delayed Hazard - No

STATE REGULATIONS

Contact 3M for more information.

CHEMICAL INVENTORIES

One or more of the components of this product have been notified to NICNAS (National Industrial Chemical Notification and Assessment Scheme) of Australia. Certain restrictions apply. Contact the selling division for additional information. The components of this product are in compliance with the chemical notification requirements of TSCA.

Contact 3M for more information.

Additional Information: The components of this product are in compliance with the chemical notification requirements of AICS, ELINCS, METI, CICS, KECI.

INTERNATIONAL REGULATIONS

Contact 3M for more information.

ADDITIONAL INFORMATION

The U.S. Environmental Protection Agency (EPA) has listed 3M(TM) HFE-7200 as an acceptable substitute for ozone depleting substances in specific solvent cleaning and aerosol industry applications under its Significant New Alternatives Program (SNAP). Section 612 of the Clean Air Act requires the EPA to administer this program to evaluate and approve alternatives for ozone depleting substances.

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: OTHER INFORMATION

NFPA Hazard Classification

Health: 3 **Flammability:** 1 **Reactivity:** 0 **Special Hazards:** None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are

presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

HMIS Hazard Classification

Health: 0 **Flammability:** 1 **Reactivity:** 0 **Protection:** X - See PPE section.

Hazardous Material Identification System (HMIS(r)) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS(r) ratings are to be used with a fully implemented HMIS(r) program. HMIS(r) is a registered mark of the National Paint and Coatings Association (NPCA).

Revision Changes:
Section 16: NFPA hazard classification heading was modified.
Section 16: HMIS hazard classification heading was modified.
Section 3: Potential environmental effects heading was modified.
Section 4: Note to physicians heading was modified.
Section 8: Exposure guidelines data source legend was modified.
Section 15: 311/312 hazard categories heading was modified.
Section 15: International regulations information was modified.
Section 15: State regulations information was modified.
Section 15: US federal regulations information was modified.
Section 15: WHMIS regulations comment was modified.
Section 10: Hazardous polymerization heading was modified.
Section 15: WHMIS regulations comment heading was modified.
Section 14: ID Number(s) was modified.
Section 16: HMIS explanation was modified.
Section 16: NFPA explanation was modified.
Section 15: Inventories information was modified.
Section 12: Ecotoxicological information heading was modified.
Section 12: Chemical fate information heading was modified.
Section 8: Exposure guidelines ingredient information was modified.
Section 16: NFPA hazard classification for special hazards was modified.
Section 15: Inventories comment was modified.
Section 10: Hazardous decompostion heading was modified.
Section 11: Product-based toxicology information comment was modified.
Section 11: Product-based toxicology information comment heading was modified.
Section 2: Ingredient phrase was added.

3M MSDSs are available at www.3M.com