



Safety Data Sheet

Copyright, 2024, 3M Company. All rights reserved. Copying and/or downloading of this information for the purpose of properly utilizing 3M products is allowed provided that: (1) the information is copied in full with no changes unless prior written agreement is obtained from 3M, and (2) neither the copy nor the original is resold or otherwise distributed with the intention of earning a profit thereon.

This Safety Data Sheet has been prepared in accordance with the SS586 Specification for Hazard Communication for Hazardous Chemicals and Dangerous Goods.

Document group:	19-2786-2	Version number:	2.00
Issue Date:	30/08/2024	Supersedes date:	07/03/2023

SECTION 1: Identification

1.1. Product identifier

3M Novec 649 Engineered Fluid

Product Identification Numbers

98-0212-3239-6 98-0212-3240-4 98-0212-3352-7 98-0212-3448-3 98-0212-3568-8

1.2. Recommended use and restrictions on use

Recommended use

For industrial use only; not intended for use as a medical device or drug., Heat transfer application.

Restrictions on use

3M™ Novec™ Engineered Fluids are used in a wide variety of applications, including but not limited to precision cleaning of medical devices and as lubricant deposition solvents for medical devices. When the product is used for applications where the finished device is implanted into the human body, no residual Novec solvent may remain on the parts. It is highly recommended that the supporting test results and protocol be cited during FDA registration.

3M Electronics Markets Materials Division (EMMD) will not knowingly sample, support, or sell its products for incorporation in medical and pharmaceutical products and applications in which the 3M product will be temporarily or permanently implanted into humans or animals. The customer is responsible for evaluating and determining that a 3M EMMD product is suitable and appropriate for its particular use and intended application. The conditions of evaluation, selection, and use of a 3M product can vary widely and affect the use and intended application of a 3M product. Because many of these conditions are uniquely within the user's knowledge and control, it is essential that the user evaluate and determine whether the 3M product is suitable and appropriate for a particular use and intended application, and complies with all local applicable laws, regulations, standards, and guidance.

1.3. Supplier's details

Address:	3M Technologies (S) Pte Ltd, 10 Ang Mo Kio Street 65, Singapore 569059
Telephone:	+65 6450 8888
Website:	www.3m.com.sg

1.4. Emergency telephone number

+65 6591 6601 (8.15am - 5.00pm, Monday - Friday)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

Reproductive Toxicity: Category 2.

2.2. Label elements**SIGNAL WORD**

WARNING!

Symbols

Health Hazard |

Pictograms**HAZARD STATEMENTS**

H361 Suspected of damaging fertility or the unborn child.

PRECAUTIONARY STATEMENTS**Prevention:**

P280F Wear respiratory protection.

2.3. Other hazards

None known.

SECTION 3: Composition/information on ingredients

This material is a mixture.

Ingredient	CAS Nbr	% by Wt
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	>= 99.5

SECTION 4: First aid measures**4.1. Description of first aid measures****Inhalation**

Remove person to fresh air. If you are concerned, get medical advice.

Skin contact

Wash with soap and water. If you are concerned, get medical advice.

Eye contact

If exposed, flush eyes with large amounts of water. Remove contact lenses if easy to do. Continue rinsing. If signs/symptoms develop, get medical attention.

If swallowed

Rinse mouth. If you are concerned, get medical advice.

4.2. Most important symptoms and effects, both acute and delayed

No critical symptoms or effects. See Section 11.1, information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required

Not applicable

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Use a fire fighting agent suitable for the surrounding fire.

5.2. Special hazards arising from the substance or mixture

Exposure to extreme heat can give rise to thermal decomposition.

Hazardous Decomposition or By-Products

Substance

Carbon monoxide.

Carbon dioxide.

Toxic Vapor/Gas

Condition

During combustion.

During combustion.

During combustion.

5.3. Special protective actions for fire-fighters

Wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate area. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.

6.2. Environmental precautions

Avoid release to the environment. For larger spills, cover drains and build dykes to prevent entry into sewer systems or bodies of water.

6.3. Methods and material for containment and cleaning up

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. Remember, adding an absorbent material does not remove a physical, health, or environmental hazard. Collect as much of the spilled material as possible. Place in a closed container approved for transportation by appropriate authorities. Clean up residue with an appropriate solvent selected by a qualified and authorised person. Ventilate the area with fresh air. Read and follow safety precautions on the solvent label and Safety Data Sheet. Seal the container. Dispose of collected material as soon as possible in accordance with applicable local/regional/national/international regulations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Contents may be under pressure, open carefully. Avoid inhalation of thermal decomposition products. For industrial/occupational use only. Not for consumer sale or use. Do not use in a confined area with minimal air exchange. Do not handle until all safety precautions have been read and understood. Avoid breathing dust/fume/gas/mist/vapours/spray. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Avoid release to the environment. Use personal protective equipment (eg. gloves, respirators...) as required.

7.2. Conditions for safe storage including any incompatibilities

Protect from sunlight. Store in a well-ventilated place. Store at temperatures not exceeding 38C/100F. Store away from strong bases. Store away from amines.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

If a component is disclosed in section 3 but does not appear in the table below, an occupational exposure limit is not available for the component.

Ingredient	CAS Nbr	Agency	Limit type	Additional comments
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Manufacturer determined	TWA(8 hours):40 ppm(517 mg/m3)	

ACGIH : American Conference of Governmental Industrial Hygienists

AIHA : American Industrial Hygiene Association

CMRG : Chemical Manufacturer's Recommended Guidelines

Singapore PELs : Singapore. Workplace Safety and Health (Permissible Exposure Levels of Toxic Substances) Order

TWA: Time-Weighted-Average

STEL: Short Term Exposure Limit

CEIL: Ceiling

8.2. Exposure controls

8.2.1. Engineering controls

For those situations where the material 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. Use general dilution ventilation ... with independent air supply Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapors/spray. If ventilation is not adequate, use respiratory protection equipment with independent air supply

8.2.2. Personal protective equipment (PPE)

Eye/face protection

Eye protection not required.

Skin/hand protection

Select and use gloves and/or protective clothing approved to relevant local standards to prevent skin contact based on the results of an exposure assessment. Selection should be based on use factors such as exposure levels, concentration of the substance or mixture, frequency and duration, physical challenges such as temperature extremes, and other use conditions. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible gloves/protective clothing. Note: Nitrile gloves may be worn over polymer laminate gloves to improve dexterity.

Gloves made from the following material(s) are recommended: Neoprene.

Polymer laminate

When only incidental contact is anticipated, alternative glove material(s) may be used. If contact with the glove does occur, remove immediately and replace with a set of new gloves. For incidental contact, gloves made of the following material(s) may be used:Nitrile rubber.

If this product is used in a manner that presents a higher potential for exposure (eg. spraying, high splash potential etc.), then use of protective coveralls may be necessary. Select and use body protection to prevent contact based on the results of an Neoprene apron.

Apron - polymer laminate

Respiratory protection

An exposure assessment may be needed to decide if a respirator is required. If a respirator is needed, use respirators as part of a full respiratory protection program. Based on the results of the exposure assessment, select from the following respirator type(s) to reduce inhalation exposure:

Half facepiece or full facepiece supplied-air respirator

For questions about suitability for a specific application, consult with your respirator manufacturer.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Liquid.
Specific Physical Form:	Liquid.
Color	Colorless
Odor	Low Solvent
Odour threshold	<i>No data available.</i>
pH	<i>Not applicable.</i>
Melting point/Freezing point	-108 °C
Boiling point/Initial boiling point/Boiling range	49 °C [@ 101,324.72 Pa]
Flash point	No flash point
Evaporation rate	> 1 Units not available or not applicable. [Ref Std:BUOAC=1]
Flammability	Not applicable.
Flammable Limits(LEL)	None detected
Flammable Limits(UEL)	None detected
Vapour pressure	40.4 kPa [@ 25 °C]
Vapor Density and/or Relative Vapor Density	11.6 [Ref Std:AIR=1]
Density	1.6 g/ml
Relative density	1.6 [@ 20 °C] [Ref Std:WATER=1]
Water solubility	Nil
Solubility- non-water	<i>No data available.</i>
Partition coefficient: n-octanol/water	<i>No data available.</i>
Autoignition temperature	<i>Not applicable.</i>
Decomposition temperature	<i>No data available.</i>
Kinematic Viscosity	0.375 mm ² /sec
Volatile organic compounds (VOC)	1,600 g/l [Test Method:calculated SCAQMD rule 443.1]
Percent volatile	100 %
VOC less H ₂ O & exempt solvents	1,600 g/l [Test Method:calculated SCAQMD rule 443.1]
Molecular weight	<i>No data available.</i>

Particle Characteristics	<i>Not applicable.</i>
--------------------------	------------------------

SECTION 10: Stability and reactivity

10.1 Reactivity

This material may be reactive with certain agents under certain conditions - see the remaining headings in this section

10.2 Chemical stability

Stable.

10.3 Possibility of hazardous reactions

Hazardous polymerisation will not occur.

10.4 Conditions to avoid

Light.

10.5 Incompatible materials

Strong bases.
Amines.
Alcohols.

10.6 Hazardous decomposition products

Substance

Hydrogen Fluoride

Condition

At elevated temperatures. - extreme conditions of heat

Refer to section 5.2 for hazardous decomposition products during combustion.

Extreme heat arising from situations such as misuse or equipment failure can generate hydrogen fluoride as a decomposition product.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labelling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1 Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation

May cause additional health effects (see below).

Skin contact

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

Eye contact

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

Ingestion

No known health effects.

Additional Health Effects:

Reproductive/Developmental Toxicity:

Contains a chemical or chemicals which can cause birth defects or other reproductive harm.

Toxicological Data

If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

Name	Route	Species	Value
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Dermal	Professional judgement	LD50 estimated to be > 5,000 mg/kg
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Ingestion	Professional judgement	LD50 estimated to be > 5,000 mg/kg

		nal judgeme nt	
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation- Vapor (4 hours)	Rat	LC50 > 1,227 mg/l

ATE = acute toxicity estimate

Skin Corrosion/Irritation

Name	Species	Value
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Rabbit	No significant irritation

Serious Eye Damage/Irritation

Name	Species	Value
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Rabbit	No significant irritation

Sensitization:

Skin Sensitisation

Name	Species	Value
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Guinea pig	Not classified

Respiratory Sensitisation

For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

Name	Route	Value
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	In Vitro	Not mutagenic
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	In vivo	Not mutagenic

Carcinogenicity

For the component/components, either no data are currently available or the data are not sufficient for classification.

Reproductive Toxicity

Reproductive and/or Developmental Effects

Name	Route	Value	Species	Test result	Exposure Duration
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	Not classified for female reproduction	Rat	NOAEL 38.7 mg/l	premating & during gestation
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	Not classified for male reproduction	Rat	NOAEL 38.7 mg/l	premating & during gestation
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	Toxic to development	Rabbit	LOAEL 38.8 mg/l	during gestation

Target Organ(s)

Specific Target Organ Toxicity - single exposure

Name	Route	Target Organ(s)	Value	Species	Test result	Exposure Duration
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	nervous system	Not classified	Rat	NOAEL 100,000 ppm	2 hours

1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	cardiac sensitization	Not classified	Dog	Sensitization Negative	17 minutes
--	------------	-----------------------	----------------	-----	------------------------	------------

Specific Target Organ Toxicity - repeated exposure

Name	Route	Target Organ(s)	Value	Species	Test result	Exposure Duration
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	Inhalation	liver kidney and/or bladder heart endocrine system hematopoietic system muscles nervous system respiratory system vascular system	Not classified	Rat	NOAEL 38.6 mg/l	90 days

Aspiration Hazard

For the component/components, either no data are currently available or the data are not sufficient for classification.

Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. Additional information leading to material classification in Section 2 is available upon request. In addition, environmental fate and effects data on ingredients may not be reflected in this section because an ingredient is present below the threshold for labelling, an ingredient is not expected to be available for exposure, or the data is considered not relevant to the material as a whole.

12.1. Toxicity**Acute aquatic hazard:**

GHS Acute 3: Harmful to aquatic life.

Chronic aquatic hazard:

GHS Chronic 3: Harmful to aquatic life with long lasting effects.

No product test data available.

Material	CAS Nbr	Organism	Type	Exposure	Test endpoint	Test result
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Fathead minnow	Transformation Product	96 hours	LC50	>1,070 mg/l
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Green algae	Transformation Product	96 hours	LC50	10.6 mg/l
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Water flea	Transformation Product	48 hours	EC50	>1,080 mg/l
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Green algae	Transformation Product	96 hours	NOEC	3.71 mg/l
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Activated sludge	Experimental	30 minutes	EC50	>100 mg/l

pentanone						
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Sunflower	Transformation Product	28 days	LOEC	1 mg/kg (Dry Weight)

12.2. Persistence and degradability

Material	CAS Nbr	Test type	Duration	Study Type	Test result	Protocol
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Transformation product Biodegradation	28 days	CO2 evolution	3 %CO2 evolution/THCO2 evolution	OECD 301B - Modified sturm or CO2
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Experimental Photolysis		Photolytic half-life (in air)	7.3 days (t 1/2)	
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Experimental Hydrolysis		Hydrolytic half-life	<2.5 minutes (t 1/2)	

12.3 : Bioaccumulative potential

Material	CAS Nbr	Test type	Duration	Study Type	Test result	Protocol
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Experimental BCF - Fish	28 days	Bioaccumulation factor	<4.8	OECD305-Bioconcentration
1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	Transformation product Bioconcentration		Log Kow	-1.33	ACD/Labs ChemSketch™

12.4. Mobility in soil

Please contact manufacturer for more details

12.5 Other adverse effects

Material	CAS Nbr	Ozone Depletion Potential	Global Warming Potential
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	0	1

SECTION 13: Disposal considerations

13.1. Disposal methods

Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of waste product in a permitted industrial waste facility. As a disposal alternative, incinerate in a permitted waste incineration facility. Proper destruction may require the use of additional fuel during incineration processes. Combustion products will include HF. Facility must be capable of handling halogenated materials. Empty drums/barrels/containers used for transporting and handling hazardous chemicals (chemical substances/mixtures/preparations classified as Hazardous as per applicable regulations) shall be considered, stored, treated & disposed of as hazardous wastes unless otherwise defined by applicable waste regulations. Consult with the respective regulating authorities to determine the available treatment and disposal facilities.

SECTION 14: Transport Information

International Regulations

UN No.: Not restricted for transport.

UN Proper shipping name: Not restricted for transport.

Transportation Class (IMO): None assigned

Transportation Class (IATA): None assigned

Other Dangerous Goods Descriptions (IMO): None assigned

Other Dangerous Goods Descriptions (IATA): None assigned

Packing Group: None assigned

Marine pollutant: None assigned

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Global inventory status

Contact 3M for more information. The components of this material are in compliance with the provisions of the Korea Chemical Control Act. Certain restrictions may apply. Contact the selling division for additional information. The components of this material are in compliance with the provisions of Japan Chemical Substance Control Law. Certain restrictions may apply. Contact the selling division for additional information. The components of this product are in compliance with the new substance notification requirements of CEPA. This product complies with Measures on Environmental Management of New Chemical Substances. All ingredients are listed on or exempt from on China IECSC inventory. The components of this product are in compliance with the chemical notification requirements of TSCA. All required components of this product are listed on the active portion of the TSCA Inventory.

This product may contain component(s) that are regulated by the following:

Workplace Safety and Health Act & Workplace Safety and Health (General Provisions) Regulations: this product is subject to SDS, labelling, PEL and other requirements in the Act/Regulations.

SECTION 16: Other information

DISCLAIMER: The information on this Safety Data Sheet is based on our experience and is correct to the best of our knowledge at the date of publication, but we do not accept any liability for any loss, damage or injury resulting from its use (except as required by law). The information may not be valid for any use not referred to in this Data Sheet or use of the product in combination with other materials. For these reasons, it is important that customers carry out their own test to satisfy themselves as to the suitability of the product for their own intended applications.

3M Singapore SDSs are available at www.3m.com.sg