



# Performance Fluid

## PF-5060DL

Product  
Information

### Introduction

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3M™ Performance Fluid PF-5060DL is a high-purity version of 3M™ Performance Fluid PF-5060. Product specifications were recently tightened to meet the increasing performance demands of the electronics industry. These specifications include ions, metals and non-volatile residue.

3M fluid PF-5060DL has been the industry standard for lubricant deposition on hard disks since ozone-depleting CFCs were regulated out of use. PF-5060DL fluid has a zero ozone depletion potential and is exempt from VOC regulations. It is a more effective solvent for depositing PTFE lubricants because it dissolves only the lubricant and essentially no water or hydrocarbons. Low viscosity and surface tension provide PF-5060DL fluid with excellent surface wetting and flow.

### Material Description

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Not for specification purposes

All values determined at 25°C unless otherwise specified

Properties	PF-5060DL
Appearance	Clear, colorless liquid
Average Molecular Weight	338
Boiling Point	56°C
Flash Point	None
Flammability Range in Air	None
Liquid Density	1.68 g/ml
Surface Tension	12 dynes/cm
Solubility of Solvent in Water	<10 ppmw
Solubility of Water in Solvent	10 ppmw
Vapor Pressure	232 mm Hg
Viscosity	0.67 cps
Heat of Vaporization, at boiling point	21 cal/g
Specific Heat	0.25 cal/g °C

## 3M™ Performance Fluid PF-5060DL Typical Purity Specifications

Purity Specifications (properties controlled and monitored for 3M fluid PF-5060DL:

Property	Units	PF-5060DL
<b>Non-Volatile Analysis*</b>		
Hydrocarbons	ppb	< 60
Silicones	ppb	ND
Esters	ppb	< 25
<b>Metals**</b>		
Ag	ppb	< 5
Al	ppb	< 5
Ba	ppb	< 5
Ca	ppb	< 5
Cd	ppb	< 5
Co	ppb	< 5
Cr	ppb	< 5
Cu	ppb	< 5
Fe	ppb	< 5
K	ppb	< 5
Li	ppb	< 5
Mg	ppb	< 5
Mn	ppb	< 5
Na	ppb	< 5
Ni	ppb	< 5
Pb	ppb	< 5
Sr	ppb	< 5
Ti	ppb	< 5
Zn	ppb	< 5

\* Certificate of Analysis specifications

\*\* Certificate of Conformance specifications

Property	Units	PF-5060DL
NVR	ppm	< 1.0
<b>Certificate of Conformance Specifications</b>		
F <sup>-</sup>	ppb	< 10
HCOO <sup>-</sup>	ppb	< 10
Cl <sup>-</sup>	ppb	< 10
NO <sub>2</sub> <sup>-</sup>	ppb	< 10
Br <sup>-</sup>	ppb	< 10
NO <sub>3</sub> <sup>-</sup>	ppb	< 10
PO <sub>4</sub> <sup>3-</sup>	ppb	< 10
SO <sub>4</sub> <sup>2-</sup>	ppb	< 10
CH <sub>3</sub> COO <sup>-</sup>	ppb	< 15
C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>	ppb	< 10

## Safety and Handling

Before using this product, please read the current product Material Safety Data Sheet (available through your 3M sales or technical service representative) and the precautionary statement on the product package. Follow all applicable precautions and directions. Toxicity studies show that PFCs are non-irritating to the eyes and skin, are practically non-toxic orally, and have low inhalation toxicity (Product Toxicity Summary Sheet available upon request). 3M fluid PF-5060DL is nonflammable. This fluid is highly resistant to thermal breakdown and hydrolysis in storage and during use. The Material Safety Data Sheet (MSDS) provides recommended handling procedures.

## 3M™ Performance Fluid PF-5060DL Materials Compatibility

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The fully-fluorinated structure of 3M fluid PF-5060DL results in a high degree of compatibility with most of the metals, plastics and elastomers used in computer disk substrates and lubrication equipment. 3M PFCs have shown good compatibility with particularly sensitive plastics such as polycarbonate and acrylics. 3M fluid PF-5060DL will not attack PTFE.

## Environmental Properties

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3M fluid PF-5060DL has zero ozone depletion potential. The material is exempt from the U.S. EPA and most state definitions of a volatile organic compound (VOC) because it does not contribute to ground-level smog formation.

PF-5060DL fluid, a perfluorocarbon (PFC), has a high global warming potential and a long atmospheric lifetime. As such, it should be carefully managed to minimize emissions.

3M™ Novec™ Engineered Fluids (HFES) should be considered as an alternative to PF-5060DL fluid if practical, because of their shorter atmospheric lifetimes and lower global warming potentials.

3M recommends that users of PF-5060DL fluid limit emissions by employing good conservation practices, and by implementing recovery, recycling and/or proper disposal procedures. For details about 3M's used fluid return program, see back cover.

Properties	PF-5060DL
Ozone depletion potential <sup>1</sup> (ODP)	0.00
Global warming potential <sup>2</sup> (GWP)	9000
Atmospheric lifetime in years	3200

<sup>1</sup> CFC-11 = 1.0

<sup>2</sup> GWP = pounds equivalent CO<sub>2</sub>, 100-year integrated time horizon (ITH)

## Packaging and Availability

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PF-5060DL fluid may be ordered in the following container sizes:

- 55-gallon drum (750 lbs);
- 3.5-gallon pail (46 lbs);
- 1-gallon glass container (14 lbs)

## 3M™ Performance Fluid PF-5060DL Toxicity Profile

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The toxicological testing completed on 3M fluid PF-5060DL shows the overall toxicity is low. The material is practically non-irritating to the eyes and skin and is not a mutagen or cardiac sensitizer. It is rated “practically non-toxic” through inhalation. A 90-day inhalation study has established an observable adverse effect level at >50,000 ppm.

### Toxicological Test Results

Properties	PF-5060DL
Acute Lethal Inhalation Concentration	>5,260 mg/L (1 hour)
Oral	Practically non-toxic (>5 g/kg)
Eye Irritation	Non-irritating
Skin Irritation	Non-irritating
Mutagenicity	Negative (Ames)
Cardiac Sensitization	No signs of sensitization at exposures up to 175,000 ppm
Ecotoxicity Testing	Complete—very low aquatic toxicity
90-day Inhalation	No observable adverse effect level >50,000 ppm

## Regulatory Status

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3M fluid PF-5060DL has been accepted for commercial use by regulatory agencies in the United States, Canada, Japan, Korea, Australia, Europe, and the Philippines.

In addition, PF-5060DL fluid has been excluded by the U.S. EPA from the definition of a VOC on the basis that this compound has negligible contribution to tropospheric ozone formation.

Contact your local 3M representative regarding the regulatory status of PF-5060DL fluid in other countries.

## Environmental Policy

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3M will recognize and exercise its responsibility to:

- prevent pollution at the source wherever and whenever possible
- develop products that will have a minimal effect on the environment
- conserve natural resources through the use of reclamation and other appropriate methods
- assure that its facilities and products meet and sustain the regulations of all Federal, State and local environmental agencies
- assist, wherever possible, governmental agencies and other official organizations engaged in environmental activities

## Used Fluid Return Program

3M offers a program for free\* pickup and return of used 3M specialty fluids in the U.S. through Safety-Kleen Corp. A pre-negotiated handling agreement between users and this service provider offers users broad protection against future liability for used 3M product. The fluid return program is covered by independent third-party financial and environmental audits of treatment, storage and disposal facilities. Necessary documentation is provided. A minimum of 30 gallons of used 3M specialty fluid is required for participation in this free program.\*

Safety-Kleen Corp. has a network of 156 branch service centers in the U.S. This large fleet will provide timely, economical fluid disposal service.

For additional information on the 3M Used Fluid Return Program, contact Safety-Kleen at this toll-free line: 1.888.932.2731. Contact your local 3M representative for fluid return programs outside the U.S.

\* Must have a 30 or more gallon purchase to participate in the 3M paid program. Used product of 5-30 gallons can be returned through Safety-Kleen at the user's expense.

## Resources

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3M™ Performance Fluid PF-5060DL is supported by global sales, technical and customer service resources, with fully-staffed technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues.

For other information on additional 3M fluids, coatings and other chemical products for the electronics industry, visit our web site at: [www.3m.com/electronics/chemicals](http://www.3m.com/electronics/chemicals)

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**Important Notice to Purchaser:** The information in this publication is based on tests that we believe are reliable. Your results may vary due to differences in test types and conditions. You must evaluate and determine whether the product is suitable for your intended application. Since conditions of product use are outside of our control and vary widely, the following is made in lieu of all express or implied warranties (including the warranties of merchantability or fitness for a particular purpose): 3M's only obligation and your only remedy is replacement of product that is shown to be defective when you receive it. In no case will 3M be liable for any special, incidental, or consequential damages based on breach of warranty or contract, negligence, strict tort, or any other theory.



### Specialty Materials

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