NSK Clean Lubricant E-DFO

NSK clean lubricant E-DFO forms a hydrocarbon oil film directly on raceway surfaces of ball screws, linear guides and balls, resulting in lower particle emissions and outgassing, and a longer life than that of existing fluororesin coating or solid lubrication in vacuum environments.

E-DFO treatment technology by NSK is the first in the world to provide special lubrication coating to rolling surfaces (patent pending).

Features of Clean Lubricant E-DFO

E-DFO lubricant coating: Thin lubricant film technology for low vapor pressure oil and absorbed substance holds its lubrication coating well.

- Low particle emissions and superior outgassing properties compared to conventional fluororesin-coated products and solid lubricant products
- Far more durable than fluororesin-coated products

Structural illustration of E-DFO lubricant coating

![Diagram of E-DFO lubricant coating](image)

- Low vapor pressure hydrocarbon oil coating that exhibits the properties of liquids and solids
- Retention intensity of lubricant coating increases due to the flake-shaped PTFE powder that has a large absorbed surface area of lubricant and retains a large quantity of lubricant coating

Notes:

E-DFO coating: E-DFO coating is a clear, colorless, low vapor pressure hydrocarbon-based, semi-dry coating that is viscous on the surface.

1. To open and handle the product: Open the package immediately before use in a clean space with the lowest possible humidity (less than 60%). Handle with gloves for clean rooms. Do not touch the product with bare hands.
2. To store: Store the product in a clean dry container such as a desiccator or vacuum chamber when not being used for a long period of time, or if not used immediately after opening. Do not use slushing oil or anti-tarnish paper on the product.
3. Do not clean: E-DFO coated products do not require cleaning. Do not clean or wipe the coating on the rolling surface—this will directly affect the lubricating function.
4. Do not apply new lubricant: E-DFO coated ball screws and linear guides do not require additional lubricant. Do not use NSK K1 lubrication unit, which will degrade E-DFO’s lubricating property.
5. Installation position: When using ball screws and linear guides vertically, an oil receiver is required under the screw shafts and rails as the E-DFO coating may drop.

Composite evaluation

<table>
<thead>
<tr>
<th>Lubricant</th>
<th>Durability</th>
<th>Particle emissions</th>
<th>Outgassing</th>
<th>Operating environment</th>
<th>Ball screws</th>
<th>Linear guides</th>
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<tbody>
<tr>
<td>E-DFO</td>
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<td>□</td>
<td>Normal atmosphere, vacuum</td>
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<td>Normal atmosphere, vacuum</td>
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<td>MoS₂</td>
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Commercially available fluorine grease

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Low outgassing properties

Outgassing property in high-temperature environments (measurement example with bearings)

Outperforms conventional fluorine-coated bearings.

Low particle emissions and superior outgassing properties compared to conventional fluororesin-coated products and solid lubricant products

Far more durable than fluororesin-coated products

Durability of ball screws

E-DFO coating extends operating life of ball screws compared to fluororesin coating.

Durability of linear guides

E-DFO coating extends operating life of linear guides compared to solid lubricant.

Notes:

E-DFO coated bearings

Conventional fluorine bearings

![Graph of ion current vs. mass number of gas](image)