

# SPACEA™ Series Bearings for Special Environments

**NSK**

NSK-exclusive advanced solutions for vacuum, cleanroom, corrosive, and high-temperature environments



**MORE THAN PRECISION**

Copyright NSK Ltd. All Rights Reserved.

# Sealed Bearings with LG2/LGU Cleanroom Grease



## Optimized grease compositions and special manufacturing processes lower particle emissions



### Features

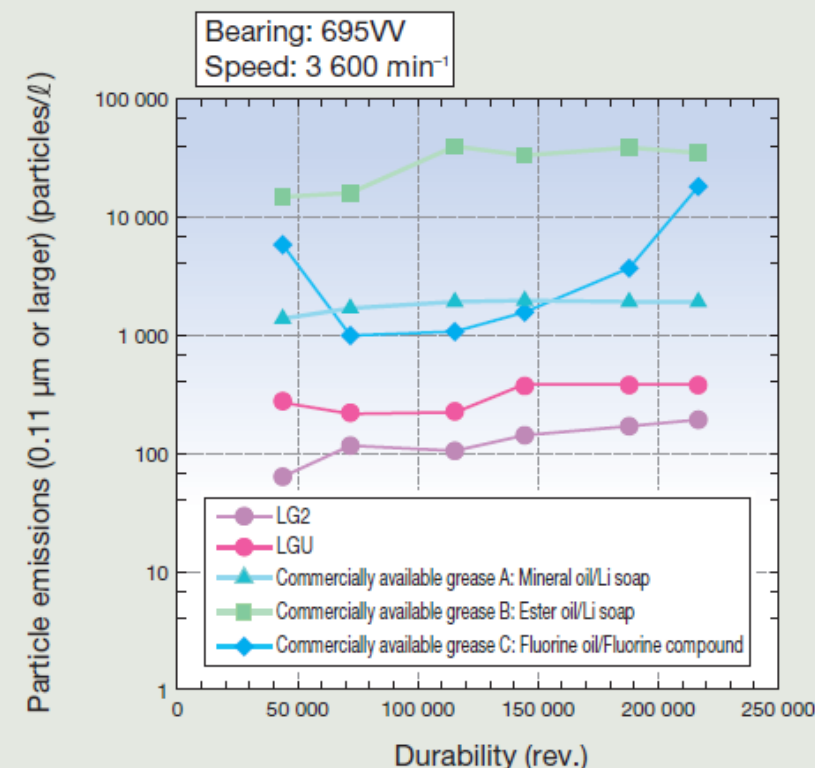
- **Low particle emissions**  
**100x fewer particle emissions** than conventional hydrocarbon grease
- **Specialized for cleanrooms, with LGU grease completely free of metallic elements**

Operating Environment	For use at atmospheric pressure only	
Product	LG2	LGU*
Base Oil	Mineral oil and synthetic hydrocarbon	Synthetic hydrocarbon
Thickener	Lithium Soap	Diurea
Kinematic viscosity (mm <sup>2</sup> /s, 40 °C)	30	94.8
Consistency	207	209
Maximum operating temperature (°C)	Up to 70	Up to 120



\*LGU grease is free of metallic elements

### Particle Emissions at Atmospheric Pressure



## MORE THAN PRECISION

Copyright NSK Ltd. All Rights Reserved.

## FG9 grease keeps particle emissions low and extends bearing life

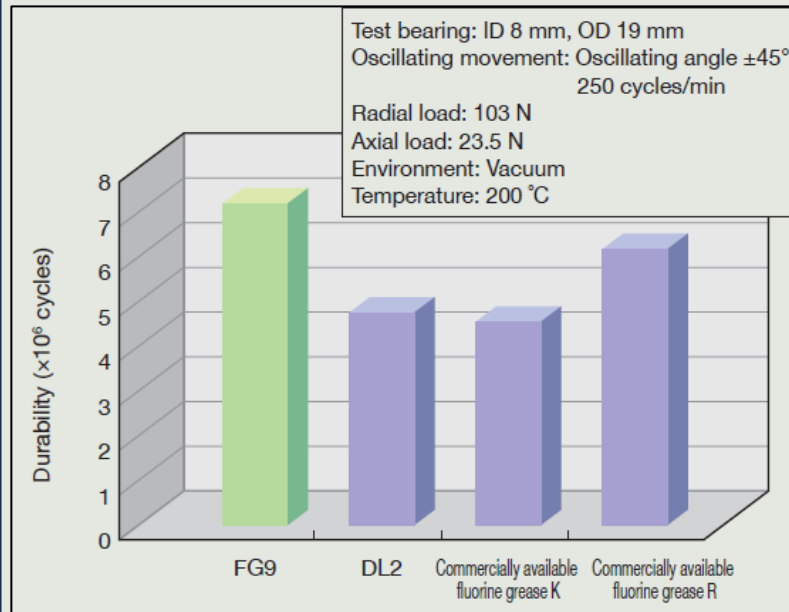


### Features

- **Low particle emissions and long life**  
NSK-exclusive compounds deliver advanced performance
- Suited for high temperatures or in vacuum
- **Compliant with PFOA regulations**

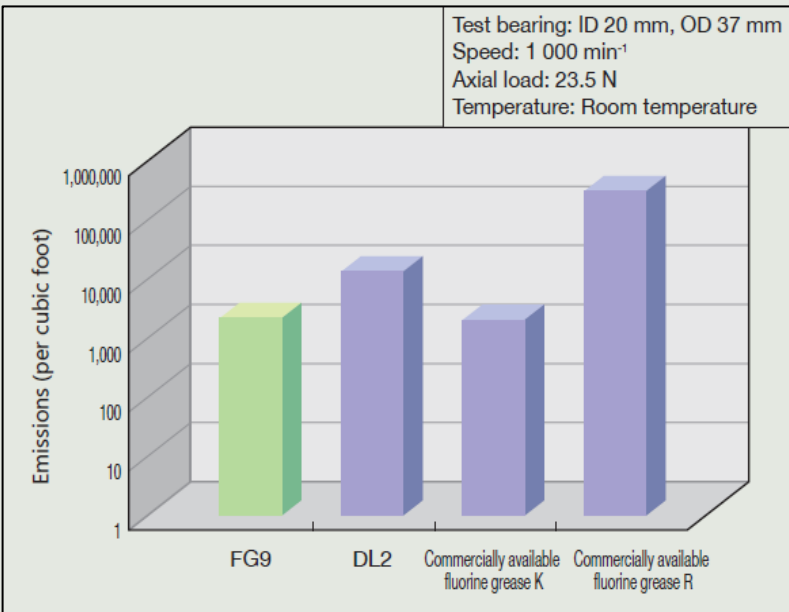


### Durability in Vacuum



**FG9 offers the longest life**

### Particle Emissions at Atmospheric Pressure



**FG9 delivers the fewest particle emissions**

# Clean Lubricant Bearings: V-DFO Fluorine Oil Lubricant Coating

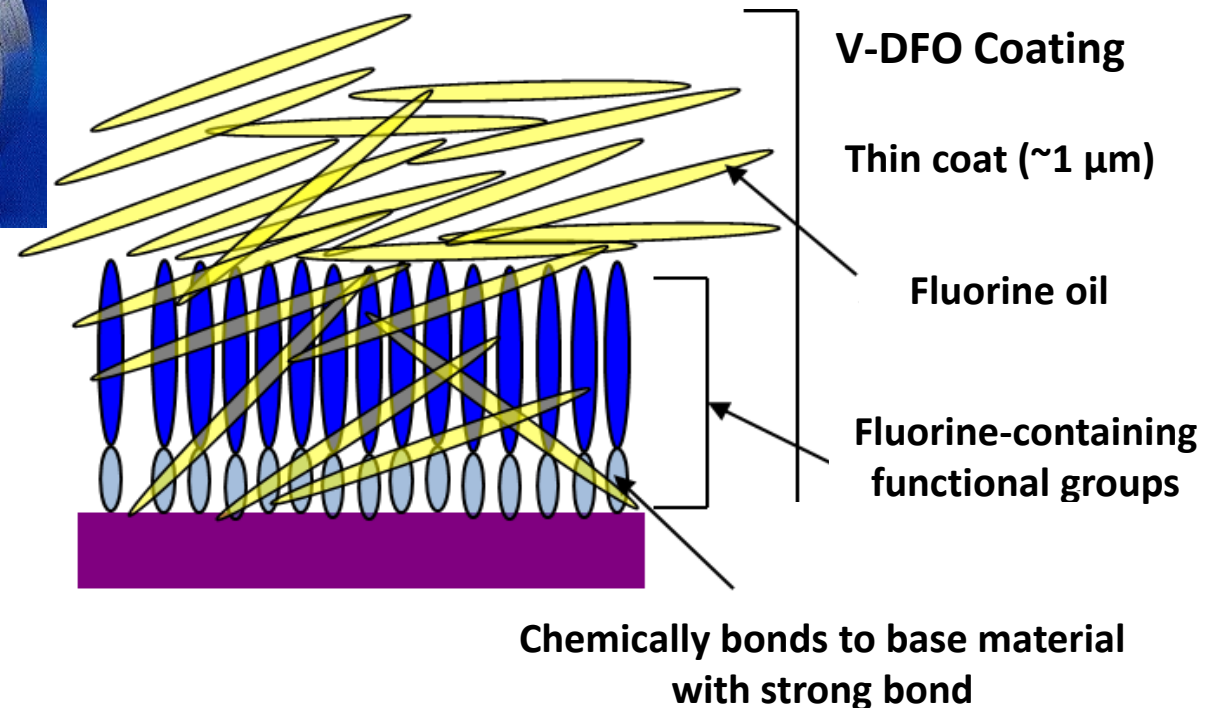


Keep outgassing low with an NSK-exclusive fluorine lubricant coating



## Features

- **Low outgassing**  
A specialized fluorine composition and surface control deliver advanced performance
- **Long life**  
Over 4x higher than conventional fluorine-coated products



**MORE THAN PRECISION**

Copyright NSK Ltd. All Rights Reserved.



## NSK's advanced material delivers excellent resistance to corrosion and long life



### Features

- Higher corrosion resistance than SUS440C
- Excellent rolling life ~10x longer than SUS440C steel.



ES1

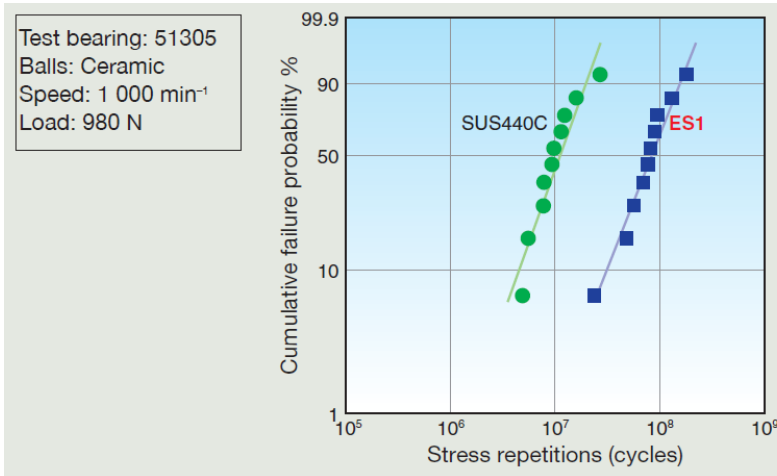
Fine and homogeneous

SUS440C

Coarse eutectic carbides

Corrosion resistance & quietness have large impacts on rolling life

### Bearing Rolling Life in Water



### Salt-Spray Test



ES1

SUS440C

Test conditions: JIS Z 2371 Std.  
5% NaCl sol, 35°C, 2 hours

# Molded-Oil Bearings



A special solid lubricant provides long life in wet and dust-filled environments and keeps equipment clean with no grease or lubrication



## Features

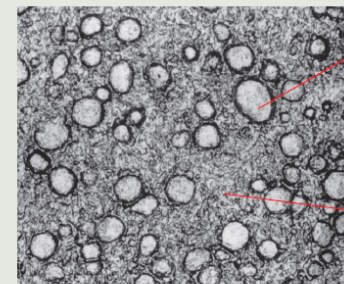
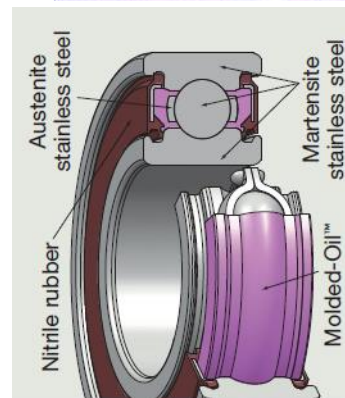
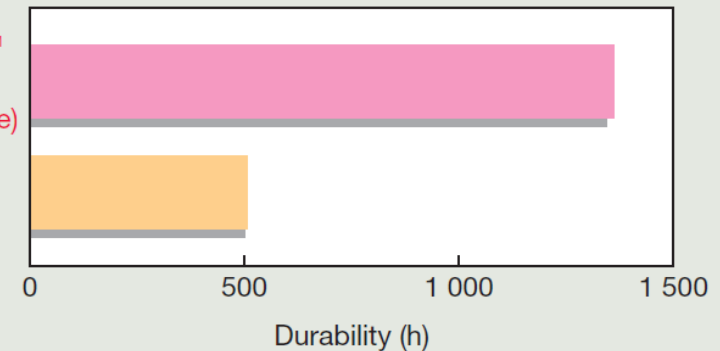
- A **special solid lubricant** provides a continuous supply of lubricating oil.
- Over **2x longer life** than conventional bearings with grease in **wet/contaminated environments**.



Test bearing: 6 000  
Speed: 1 000 min<sup>-1</sup>  
Radial load: 79.4 N  
Axial load: 29.4 N  
Water exposure: 0.8 cm<sup>3</sup>/min

## Durability Under Water Spray

Molded-Oil™  
bearings  
(General grade)  
Grease-  
lubricated  
bearings



Molded-Oil™ microstructure  
100 μm

## Portion containing high proportion of polyolefin

Polyolefin is used for packaging food in supermarkets, replacing dioxin-generating vinyl chloride.

## Portion containing high proportion of lubricating oil

Molded-Oil comes in both general-grade (mineral-oil based) and NSF H1\* food grade variants.

\* NSF Category Code H1: Incidental food contact

**MORE THAN PRECISION**

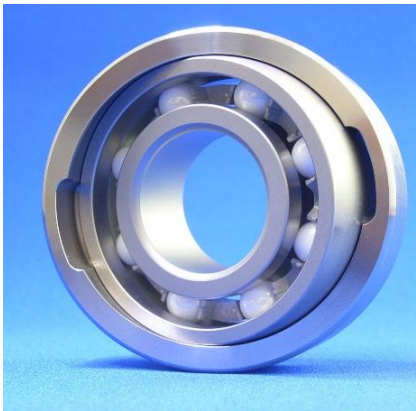
Copyright NSK Ltd. All Rights Reserved.

Get longer life with 30% higher hardness in an expanded lineup



## Features

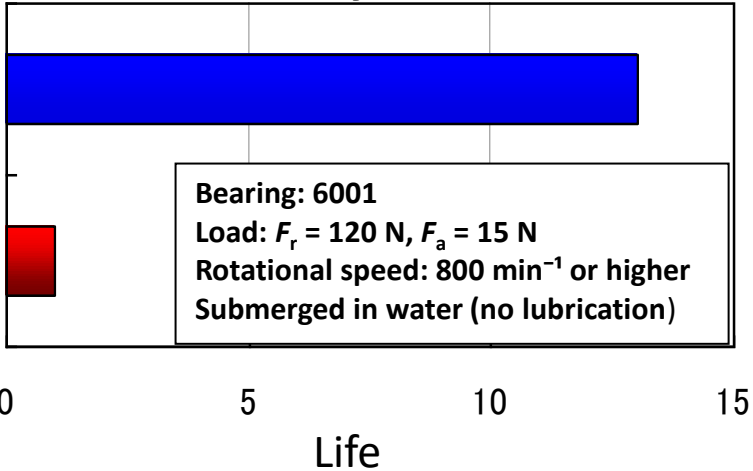
- Longer life  
Over **10x longer** life than standard SUS630 steel in water.
- **30% higher hardness** than SUS630 steel.
- Available in expanded lineup with aligning rings  
**Absorb** roll **deflection** and shaft/housing **misalignment**.



SUS630 (Conventional)

ESZ

## Durability in Water



## Corrosion Resistance

	18% hydrochloric acid	30% nitric acid	17% sodium hydroxide
SUS630	○ (1)	⊙ (No change)	⊙ (No change)
ESZ	⊙ (1/2)	⊙ (No change)	⊙ (No change)

# Aqua Bearings

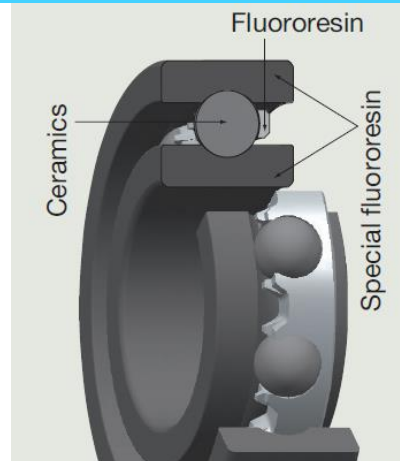
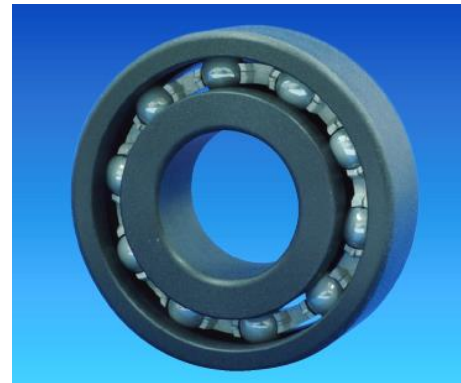


Suited for a wide range of environments with water, alkalis, or strong acids—  
With a special fluoroplastic, Aqua Bearings offer high resistance to corrosion

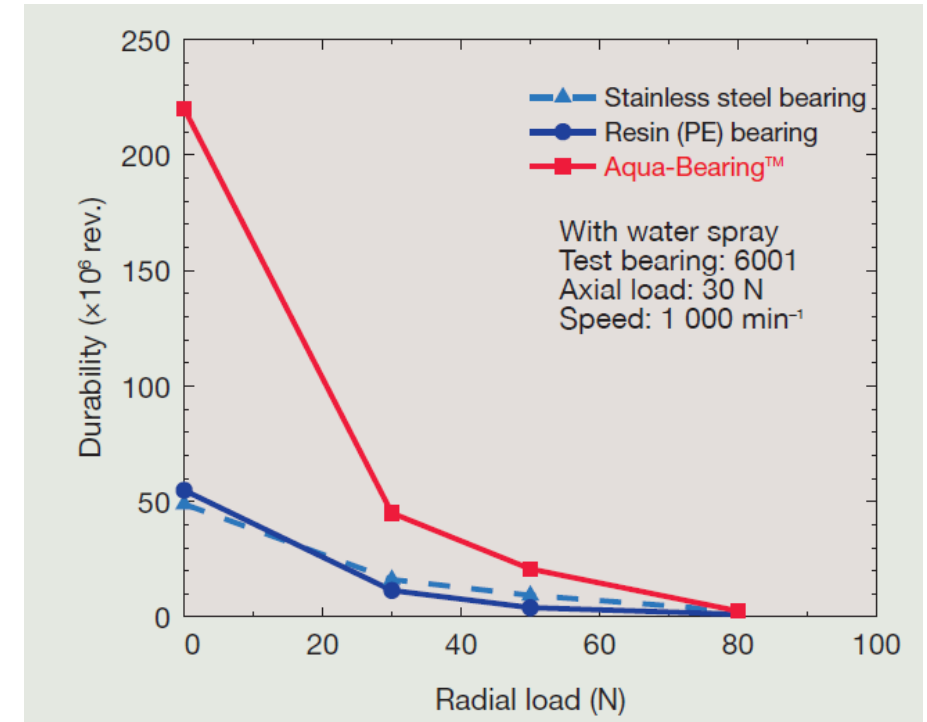


## Features

- Long life  
Over **5x longer life than** conventional PE bearings.
- High corrosion resistance  
Achieve the same corrosion resistance as with ceramic bearings.
- Greaseless and oil-free  
Keep surrounding environments clean.



## Durability Under Water Spray



**MORE THAN PRECISION**



# All-Ceramic Bearings (Oxide-Based)

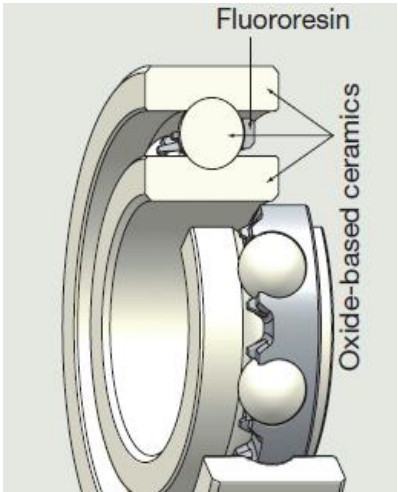
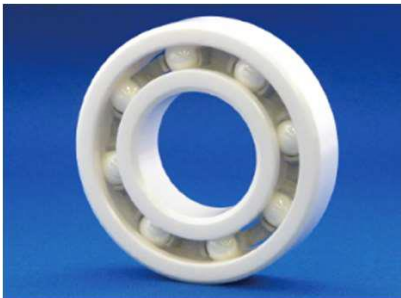


Unmatched corrosion resistance,  
with longer life than silicon nitride ceramics

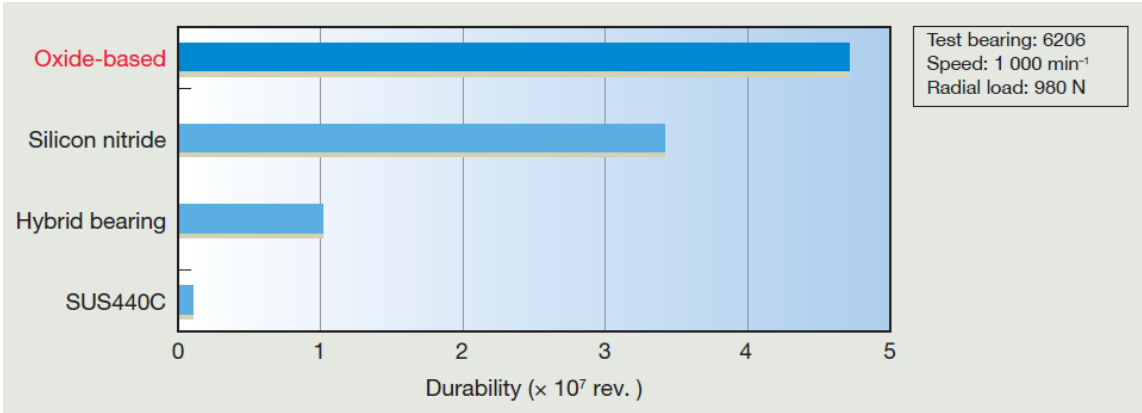


## Features

- Long life  
Achieve higher durability than with silicon nitride ( $\text{Si}_3\text{N}_4$ ).
- High corrosion resistance  
Oxide-based material delivers the highest resistance to corrosion.



Durability in Water



Evaluation item		Ceramics		Stainless steel
		Oxide-based	Silicon nitride	SUS440C
Corrosion resistance	3% Sulfuric acid (room temperature)	○	△	×
	8% Hydrochloric acid (room temperature)	○	△	×
	5% Fluoric acid (room temperature)	△	△	×
Relative permeability		1.001 or less	1.001 or less	Ferromagnetic body

Corrosion resistance evaluation ....○: Slightly corroded △: Partially corroded ×: Corroded

Copyright NSK Ltd. All Rights Reserved.

MORE THAN PRECISION

# Bearings with Long-Life/High-Temperature KPM Grease



Get long life at high temperatures with excellent lubrication provided by NSK-exclusive KPM grease

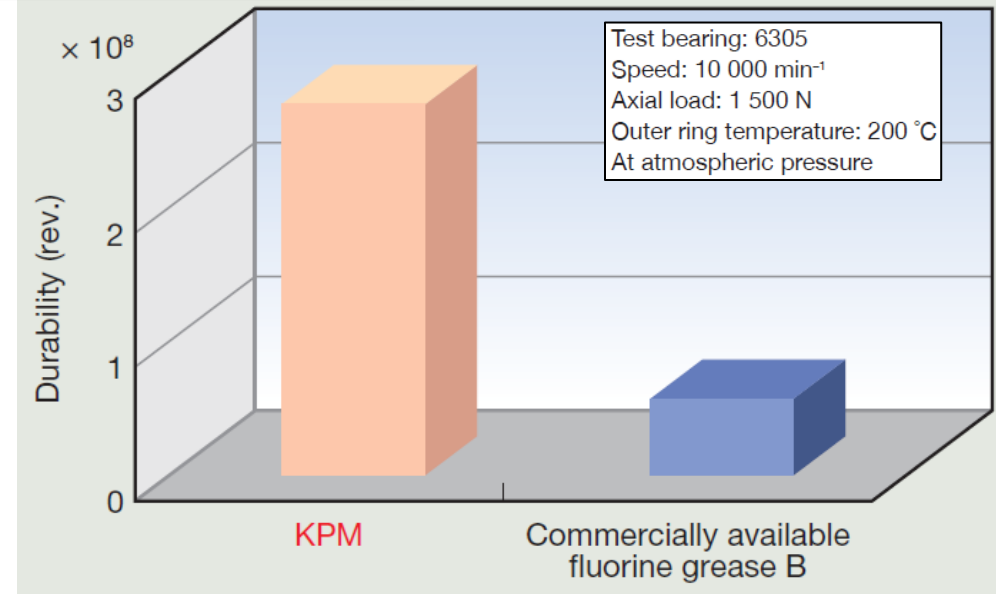


## Features

- Long life  
**5x longer life** than commercial fluorine grease at 200°C at atmospheric pressure.
- Usable at temperatures up to 230°C.

Name	NSK high-temperature KPM grease	Commercially available fluorine grease B
Base oil	Fluorine oil	Fluorine oil
Thickener	PTFE	PTFE
Kinematic viscosity (mm <sup>2</sup> /s, 40 °C)	420	390
Consistency	290	280
Maximum operating temperature (°C)	230	230

**Excellent Durability Under High Temperatures**



**MORE THAN PRECISION**

Copyright NSK Ltd. All Rights Reserved.

# High-Temperature YS Bearings With Spacer Joints

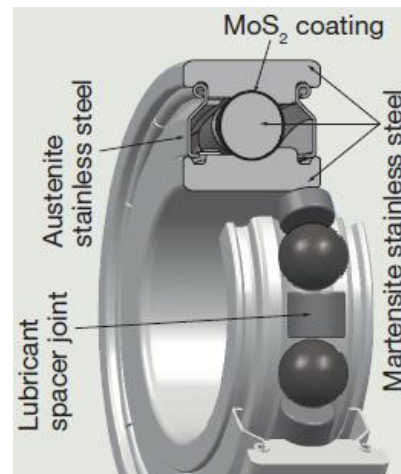


A self-lubricating sintered alloy material spaces the balls, delivering long life under high-temperature vacuum

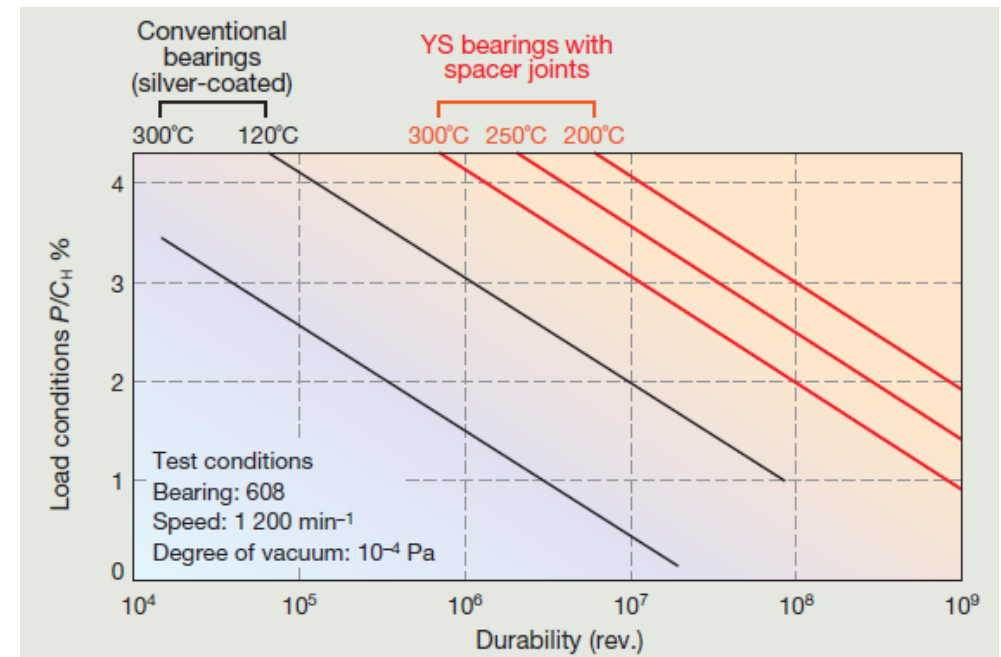


## Features

- Ideal for high-temperature vacuum  
YS bearings stand up to  $10^{-8}$  Pa vacuum and up to 350°C.
- Grease-free,  $\text{MoS}_2$  solid lubricant
- Long life  
Over **10x longer life than** conventional high-temperature bearings with solid lubricant.



## Durability in Vacuum



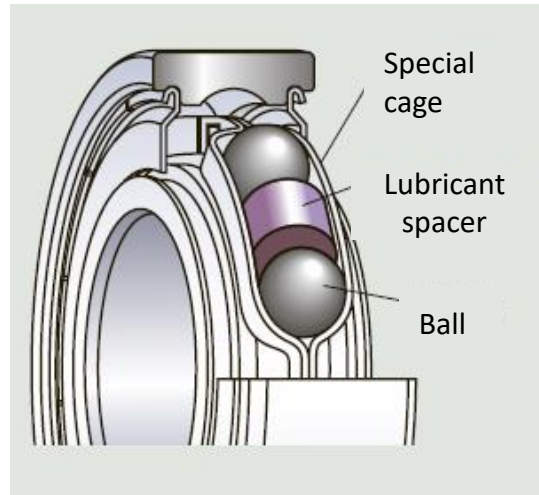
**MORE THAN PRECISION**

## Solid lubricant bearings with a unique structure stand up to 400°C temperatures and vacuum conditions



### Features

- "Peapod" structure  
Solid lubricant spacers used in the cage pockets keep balls separated.
- Wide operating range—  
Suitable for atmospheric pressure to  $10^{-8}$  Pa vacuum and up to 400°C.
- Long life  
~100x more durable than other solid lubricant bearings on the market.



### Durability at 400°C at Atmospheric Pressure

