

# THK Accommodation of Long-Term, Maintenance-Free Operation

## Introduction to Accessory Lineup

### Lubrication Accessories for Long-Term, Maintenance-Free

	LM Guide Lubricator QZ	Ball Screw Lubricator QZ
Purpose	The QZ Lubricator is installed on both ends of an LM block or ball screw. It supplies optimal amounts of lubricating oil to ball raceway to form an oil film between the balls and raceway for the realization of long-term, maintenance-free operation.	
Sketch Drawings		
Structural Diagrams		
Principle	The structure is composed of three major components consisting of a ① high oil content fiber network (which functions to store lubricating oil), ② high-density fiber network ( which functions to apply lubricating oil to the surface of the rolling grooves), and ③ oil control plate (which functions to control the flow of lubricating oil). Application of lubricating oil by the QZ is based on the principle of capillary action that is used in felt-tip pens and other products.	
Features	<ul style="list-style-type: none"> <li>* Lubrication maintenance intervals can be significantly extended by compensating for lubricating oil loss during the course of operation.</li> <li>* Application of only the optimal amount of lubricating oil required for lubrication onto the surface of the rolling grooves prevents contamination of surroundings resulting in an environmentally-friendly system.</li> <li>* Enables selection of lubricating oil to match the particular application.</li> </ul>	

In addition to longer service life, faster operation and lower noise levels; machine tools; liquid crystal and semiconductor production systems, automated machinery, health care equipment and a wide range of other devices have recently been required to also respond to needs relating to environmental protection and conservation of resources. THK engaged in product development that is based on the concepts of environmental protection, energy conservation and long service life, and offers a vast lineup of Accessories that make it possible to realize long-term, maintenance-free operation even under harsh environmental conditions.

## 2 Dust Prevention Accessories for Long-Term, Maintenance-Free Operation

	LM Guide Contact Scraper LaCS	Ball Screw Wiper Ring W
Purpose	Contact scrapers are installed on both ends of an LM block to prevent entry of contamination particles.	Wiper rings are installed on both ends of a ball screw nut to prevent entry of contamination particles.
Sketch Drawings		
Structural Diagrams		
Principle	Contamination particles are removed in multiple stages using a laminated contact structure (3-layer scraper).	As a result of the wiper ring employing a structure in which it is brought into surface contact with the outer diameter of the ball screw shaft by a spring, foreign matter on the surface of the ball screw shaft is removed through slits at eight locations in the wiper ring by rotation of the ball screw.
Features	<ul style="list-style-type: none"> <li>* A three-layer scraper makes contact over the entire surface of the LM rail resulting in excellent foreign matter removal capabilities.</li> <li>* The use of oil-impregnated synthetic foam rubber having a self-lubrication function realizes low friction resistance.</li> </ul>	<ul style="list-style-type: none"> <li>* Contamination particles are successively removed with 8 slits located around the wiper ring to prevent entry of contamination particles.</li> <li>* Contact with the ball screw inhibits leakage of grease.</li> <li>* Heat generation is held to a minimum due to the wiper ring being held in contact with the shaft at a constant pressure by a spring.</li> <li>* The use of materials having excellent wear and chemical resistance results in low levels of performance deterioration even after long-term use.</li> </ul>

# Accessories for Use in Normal Environments

**Normal environment**

**Long-term,  
maintenance-free  
operation**

**LM Guide + Lubricator QZ**  
Applicable types: **HSR** **NRS**  
**NR**

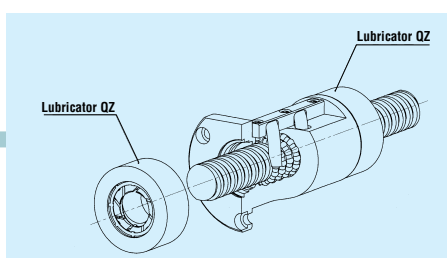
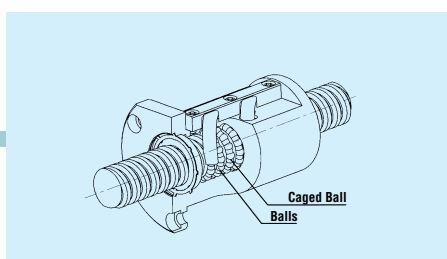
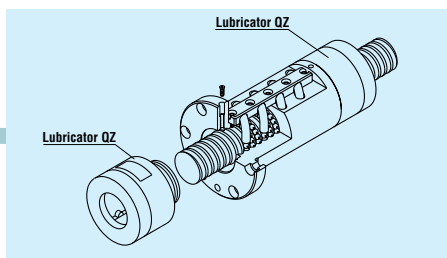
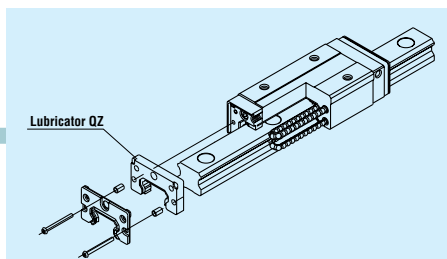
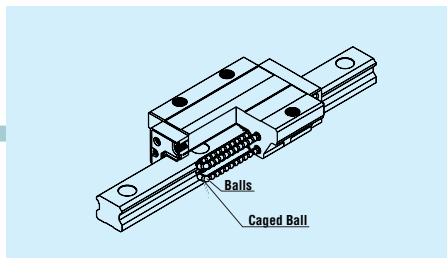
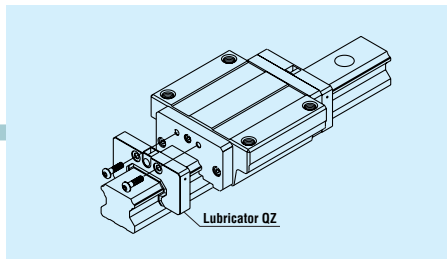
**LM Guide with Caged Ball Technology**  
Applicable types: **SHS** **SNR** **SHW**  
**SSR** **SNS** **SRS**

**LM Guide with Caged Ball Technology + Lubricator QZ**  
Applicable types: **SHS** **SNR** **SHW**  
**SSR** **SNS** **SRS**

**Ball Screw + Lubricator QZ**  
Applicable types: **BNFN** **BIF** **DK**  
**BNF** **DIK** **BTK**

**Ball Screw with Caged Ball Technology (DN value = 130,000)**  
Applicable types: **SBN**

**Ball Screw with Caged Ball Technology + Lubricator QZ (DN value = 130,000)**  
Applicable types: **SBN**



**Application 1** **When Using a Conventional Full Ball Type**

**Installing the Lubricator QZ on a full ball type realizes long-term, maintenance-free operation.**

- General industrial machinery
- Health care equipment
- Transport systems
- General-purpose machine tools

**Application 2** **When Making Ecological Accommodations**

**Use of a caged ball type realizes long-term, maintenance-free operation.**

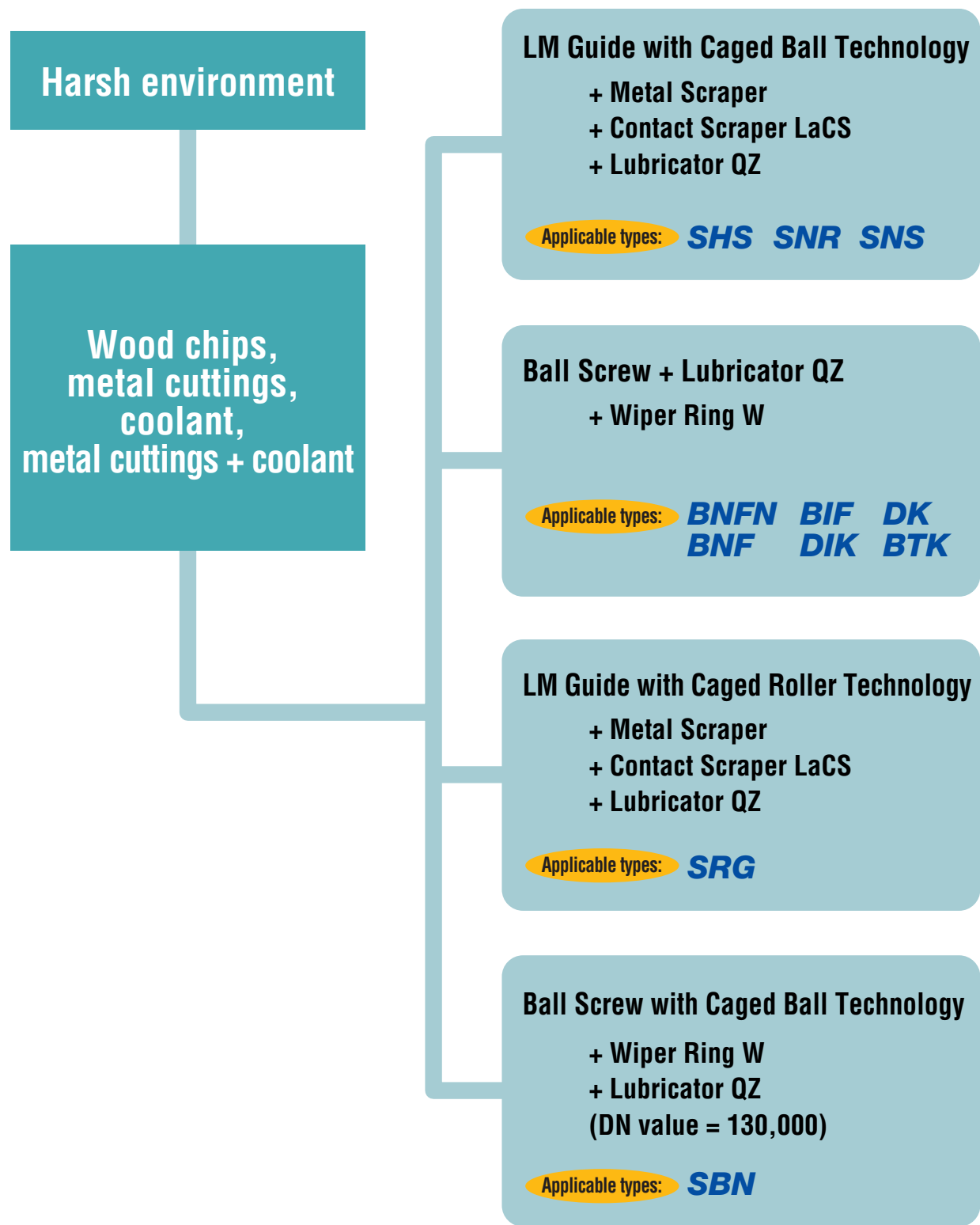
- General industrial machinery
- Injection molding machines
- Electrical discharge machines
- Liquid crystal and semiconductor production systems
- Three-dimensional measuring instruments
- Precision optical stages

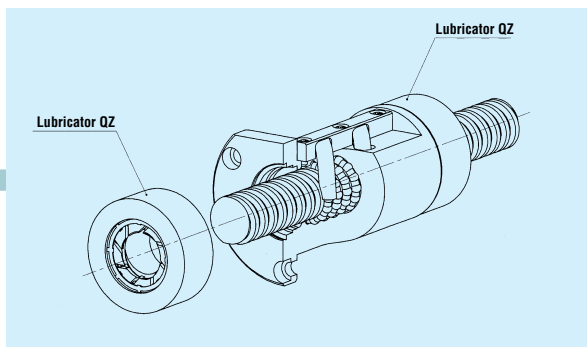
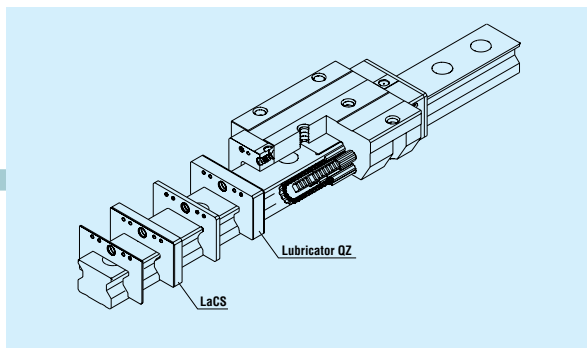
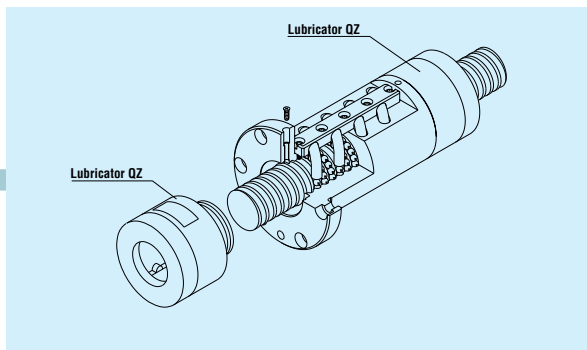
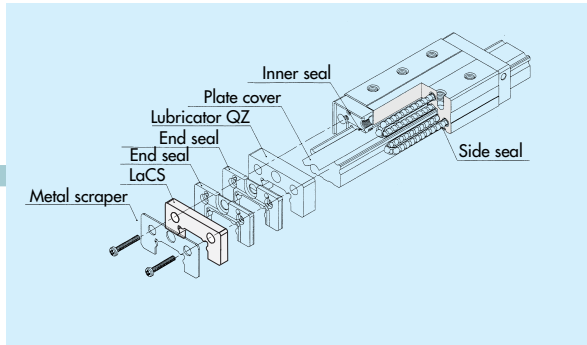
**Application 3** **When operating at high speed and consuming large amounts of lubricating oil**

**Installing the Lubricator QZ on a Caged ball type makes it possible to compensate for oil loss.**

- High-speed chip mounters
- Injection molding machines
- Various types of high-speed transport systems
- High-speed robots
- High-speed, general-purpose machine tools

# Accessories for Use in Harsh Environments





**Application 1** **Highly Rigid Structures**

- Welding machines (servo gun)
- Laser machining systems
- Punching presses
- Graphite machining systems
- Woodworking machines
- Machining centers
- NC lathes
- High-rigidity machine tools

**Application 2** **Ultra-Highly Rigid Structures**

- Ultra-high-rigidity machine tools
- High-precision machining centers
- High-precision NC lathes
- Jig borers
- Five-face processing machines

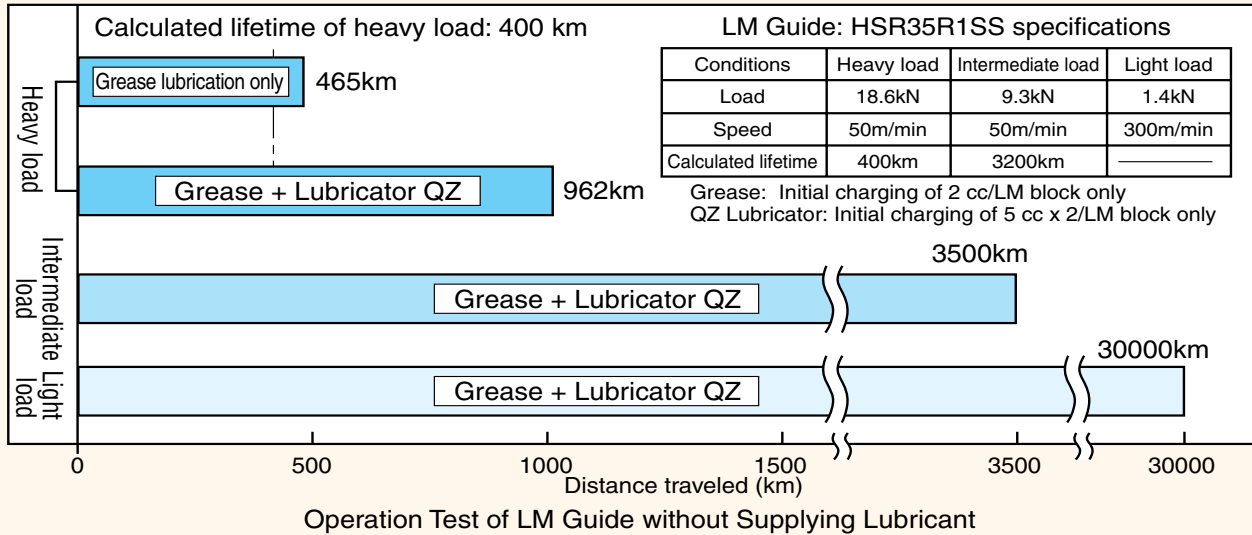
**Application 3** **High-speed Movement**

- Welding machines (servo gun)
- Laser machining systems
- Punching presses
- Graphite machining systems
- Woodworking machines
- High-speed machining centers
- High-speed NC lathes

# Performance of the LM Guide Lubricator QZ

## 1) Significant Extension of Maintenance Intervals

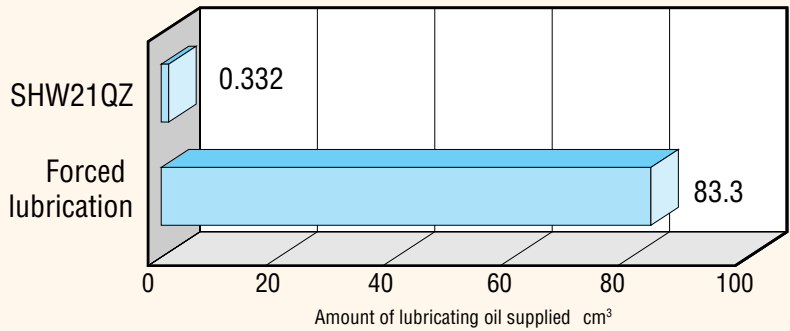
Installation of the Lubricator QZ is effective for extending maintenance intervals over all load ranges from light loads to heavy loads.



## 2) Effective Utilization of Lubricating Oil

Since the Lubricator QZ provides a suitable amount of lubricating oil at suitable locations, lubricating oil can be used effectively without waste.

### Comparison of amount of lubricating oil used after traveling 5000 km



The amount of lubricating oil used was 1/250th that of forced lubrication.

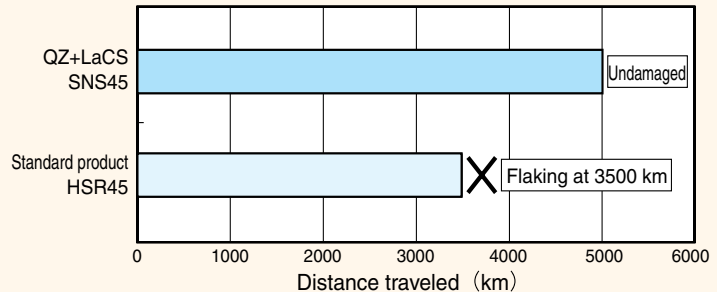
## 3) Lubrication Supportive Effects in Harsh Environments

5000 km endurance testing was conducted in a harsh environment (in the presence of coolant and foreign matter).

[Test Conditions]

Type	SNS45	HSR45
Load	Applied load/dynamic rated load C/P = 0.1	
Speed	60m/min	
Coolant	Immersed for 48 hours, dried for 96 hours	
Foreign matter	Cast powder (125 μm or smaller)	
Lubrication	AFA Grease + QZ	Super-Multi 68 Operating cycle:0.1cc/shot Intermittent time:16min

[Test Results]



\* In the case of using in harsh environments, please use the Lubricator QZ in combination with the Contact Scraper LaCS (see page 5).

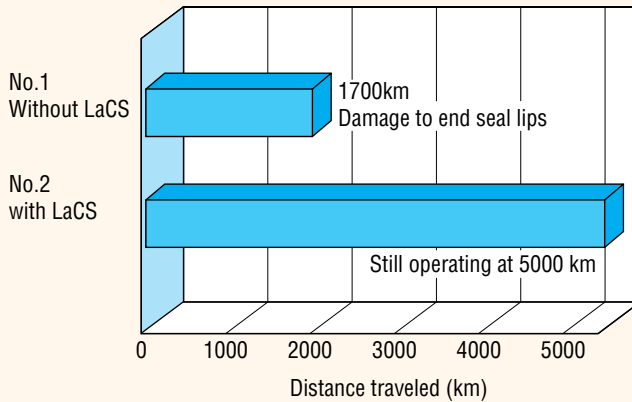
# Performance of the LM Guide Laminated Contact Scraper **LaCS**

## 1) Testing in Water-Soluble Coolant Environment

[Test Conditions] Test environment: Water-soluble coolant

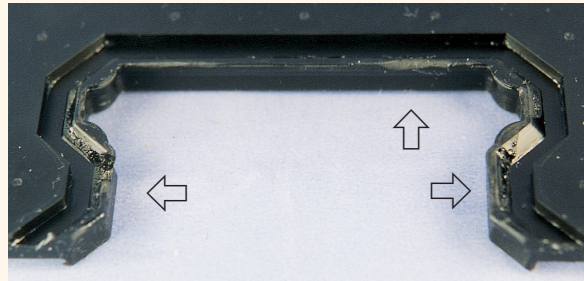
Item	Description	
Sample	No.1	SHS45R1SS+3000L (end seals only)
	No.2	SHS45R1SSHH+3000L(LaCS installed on end seals)
Max. speed	200m/min	
Environmental conditions	Coolant application cycle: 5 times/day	

[Test Results]



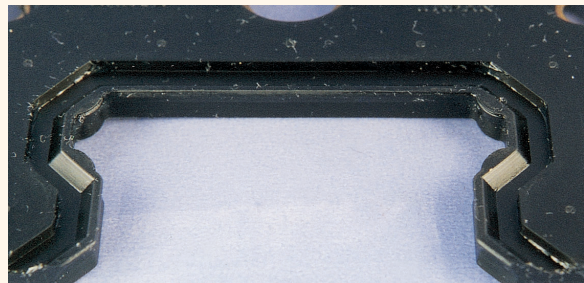
### Enlarged Photograph of End Seal Lip

No.1 : Without LaCS: Damaged lip at 1700 km



Arrows indicated damaged areas

No.2 : With LaCS: No abnormalities after traveling 5000 km



No damage to the lip

## 2) Testing in Microscopic Foreign Matter Environment

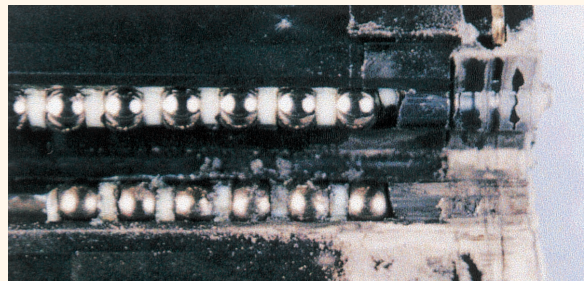
[Test Conditions] Test environment: Microscopic foreign matter environment

Item	Description	
Sample	No.1	SNR45R1DD+600L (installed with double end seals only)
	No.2	SNR45R1HH+600L (installed with LaCS only)
Max. speed and acceleration	60m/min, 1G	
External load	9.6kN	
Foreign matter	Type:FCD450#115 (particle size of 125µm or conditions smaller)	
	Amount applied: 1g/hr (total amount applied: 120 g)	

[Test Results] Amount of Foreign Matter on Rolling Surfaces

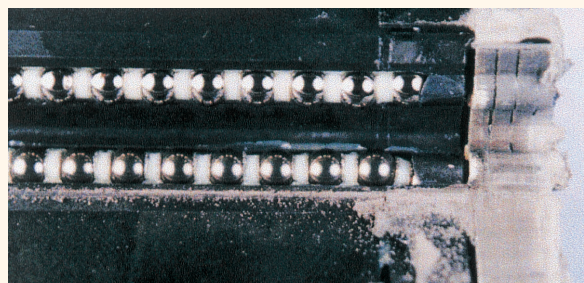
Seal configuration		Amount of foreign matter on rolling surfaces g
Conventional dustproofing specifications Double end seal specifications (two superimposed end seal structure)	Sample 1	0.3
	Sample 2	0.3
	Sample 3	0.3
LaCS specifications	Sample 1	0.0
	Sample 2	0.0
	Sample 3	0.0

NO.1 After Traveling 100 km (double seal specifications)



A large amount of foreign matter is present on the ball rolling surfaces.

NO.2 After Traveling 100 km (LaCS only)

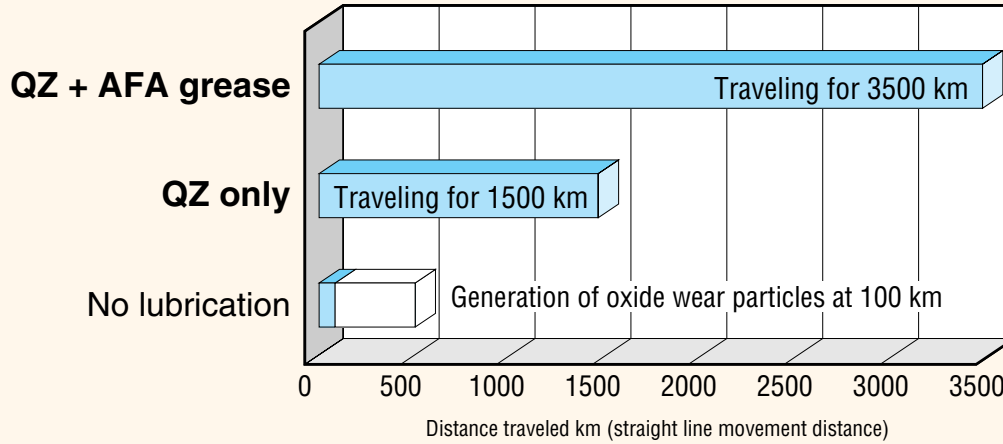


Foreign matter is confirmed to be absent on ball rolling surfaces.

# Performance of the Ball Screw Lubricator QZ

## 1) Significant Extension of Maintenance Intervals

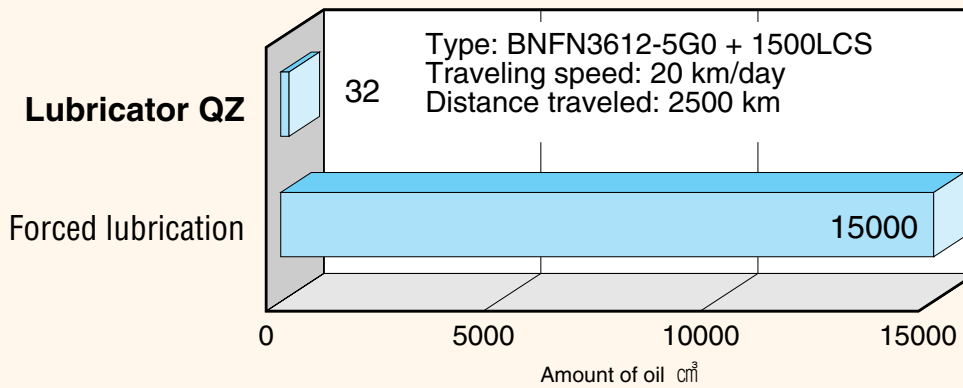
Maintenance intervals can be extended significantly since lubricating oil is continued to be supplied over a long period of time.



Ball screw	BIF2505-5
Rotational speed	3000min <sup>-1</sup>
Stroke	500mm
Load	0.46kN (by internal pre-loading)

## 2) Environmentally-Friendly Lubrication System

Since a suitable amount of oil is supplied directly to the rolling surfaces, lubricating oil can be used effectively without waste.



**Lubricator QZ + AFA grease**  
16cm<sup>3</sup>/1x2 (installed in the front and back)



**Comparison**

**Forced lubrication**  
0.25cm<sup>3</sup>/3 min x 24 hours x 125 days = 15000cm<sup>3</sup>

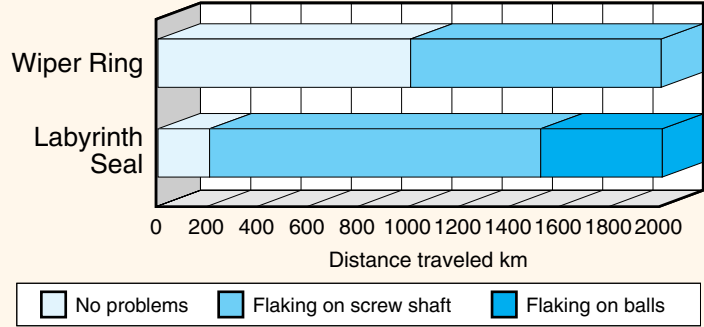
# Performance of the Ball Screw Wiper Ring **W**

## 1) Testing in a Foreign Matter Environment

[Test Conditions]

Item	Description
Type	BIF3210-5G0+1500LC5
Max. rotational speed	1000min <sup>-1</sup>
Max. speed	10m/min
Max. peripheral speed	1.8m/s
Time constant	60ms
Dwell	1s
Stroke	900mm
Load (by internal pre-loading)	1.31kN
Grease	AFG Grease 8cm <sup>3</sup> initial charging into nut only
Cast powder	FCD400, mean particle size: 250 μm
Amount of foreign matter per shaft	5g/h

[Test Results]

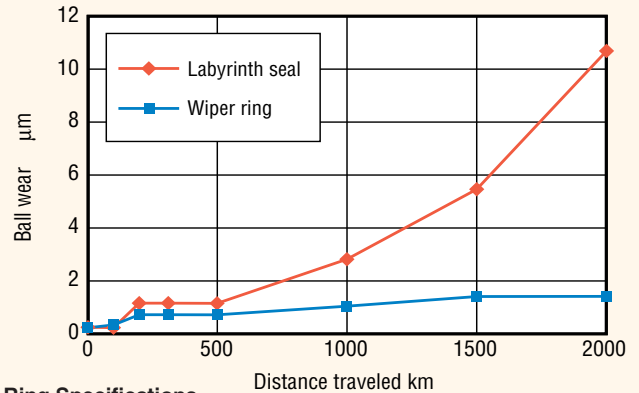
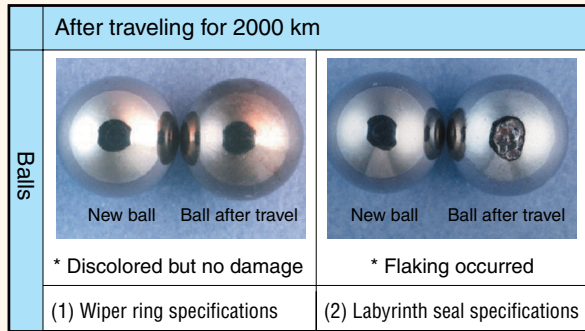


(1) Wiper Ring Specifications

Slight flaking occurred on the ball screw after traveling 1000 km.

(2) Labyrinth Seal Specifications

Flaking occurred over all screw shaft rolling channels after traveling 200 km, and flaking occurred on the balls after traveling 1500 km.



(1) Wiper Ring Specifications

The amount of ball wear was 1.4 μm after traveling 2000 km.

(2) Labyrinth Seal Specifications

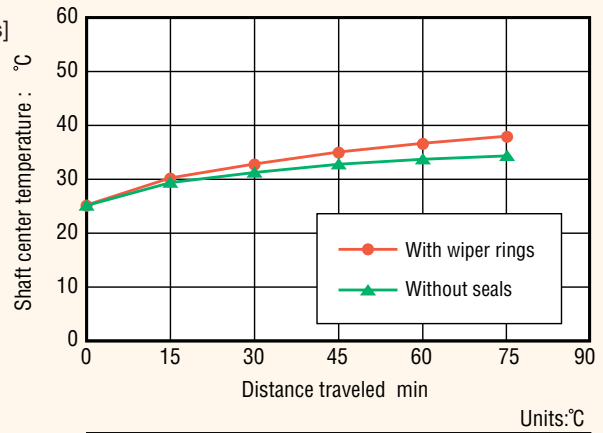
Wear proceeded rapidly starting at 500 km, and the amount of ball wear was 11 μm after traveling 2000 km.

## 2) Heat Generation Test

[Test Conditions]

Item	Description
Type	BLK3232DG0+1426LC5
Max. rotational speed	1000min <sup>-1</sup>
Max. speed	32m/min
Max. peripheral speed	1.7m/s
Time constant	100ms
Stroke	1000mm
Load (by pre-loading only)	0.98kN
Grease	AFG Grease 5cm <sup>3</sup> (charged into nut)

[Test Results]



	With wiper rings	Without seals
Heat generation temperature	37.1	34.5
Temperature rise	12.2	8.9

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**Technical  
Reference**

# Smooth Silent Ecological

**Accessories for Long-Term, Maintenance-Free Operation**

— **Optimum Lubrication and Dust Prevention Options for Various Applications** —