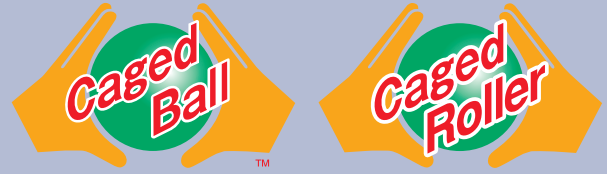


**Technical  
Reference**



# Smooth Silent Ecological

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

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

For details, visit THK at [www.thk.com](http://www.thk.com)

\*Product information is updated regularly on the THK website.

# 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 nut. 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, fiber network (which functions to control the flow of lubricating oil). Application of lubricating oil by the Lubricator 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 Laminated Contact Scraper LaCS	Ball Screw Wiper Ring W
Purpose	LaCS 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 NR/NRS*

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

**Caged Roller LM Guide**  
Applicable types: *SRG SRN*

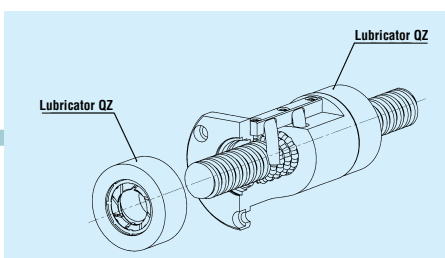
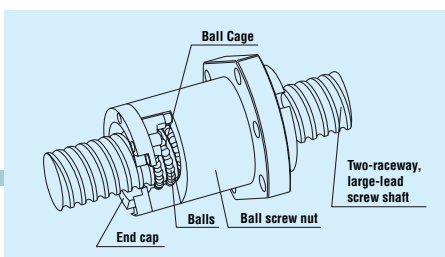
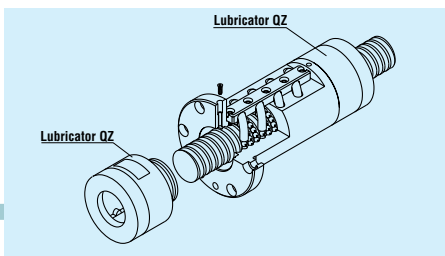
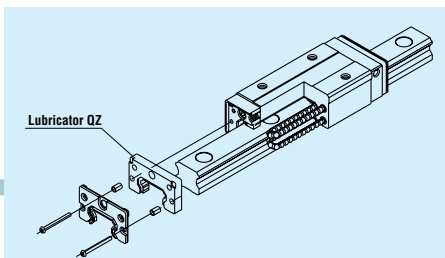
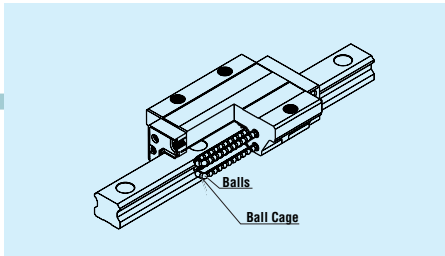
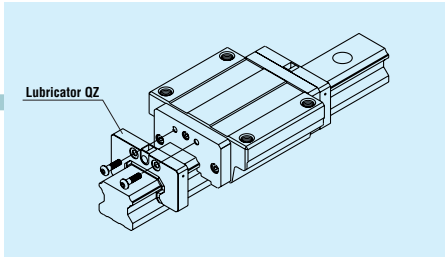
**Caged Ball LM Guide + Lubricator QZ**  
Applicable types: *SHS SNR/SNS*  
*SSR SHW SRS*

**Caged Roller LM Guide**  
Applicable types: *SRG SRN SRW*

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

**High-Speed Caged Ball Screw (DN value up to 160,000 : SBK)**  
Applicable types: *SBK HBN SBN*

**High-Speed Caged Ball Screw + Lubricator QZ (DN value up to 160,000 : SBK)**  
Applicable types: *SBK 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

**Harsh environment**

**Wood chips,  
metal cuttings,  
coolant,  
metal cuttings + coolant**

## **Caged Ball LM Guide**

- + Metal Scraper
- + Laminated Contact Scraper LaCS
- + Lubricator QZ

Applicable types: **SHS SNR/SNS**  
**SSR SHW**

## **Ball Screw + Lubricator QZ**

- + Wiper Ring W

Applicable types: **BNFN BIF DK**  
**BNF DIK BTK**

## **Caged Roller LM Guide**

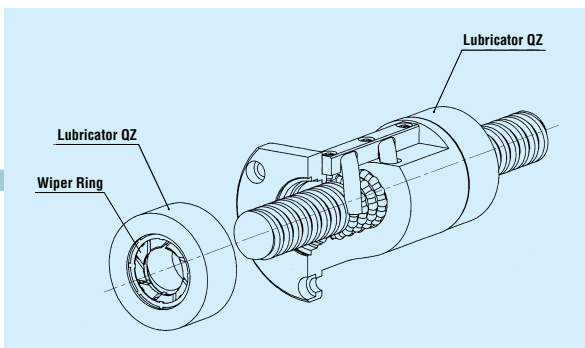
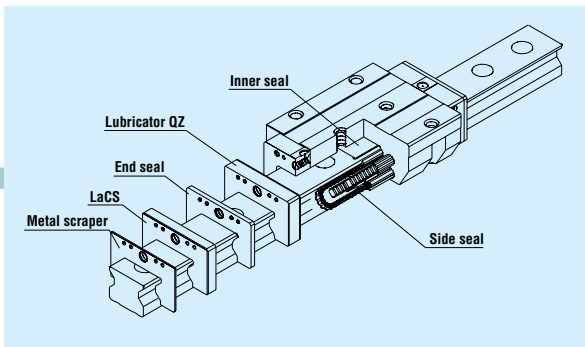
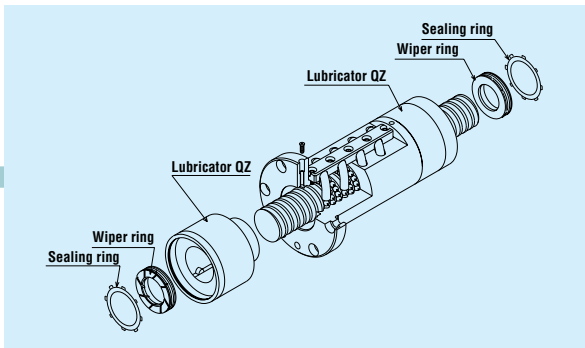
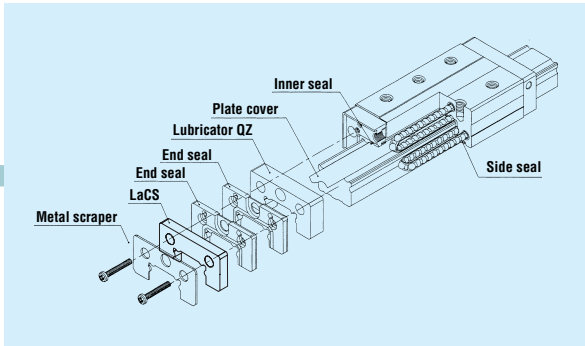
- + Metal Scraper
- + Laminated Contact Scraper LaCS
- + Lubricator QZ

Applicable types: **SRG SRN SRW**

## **High-Speed Caged Ball Screw**

- + Wiper Ring W
- + Lubricator QZ
- (DN value up to 160,000 : SBK)

Applicable types: **SBK SBN**



**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-axis processing machines

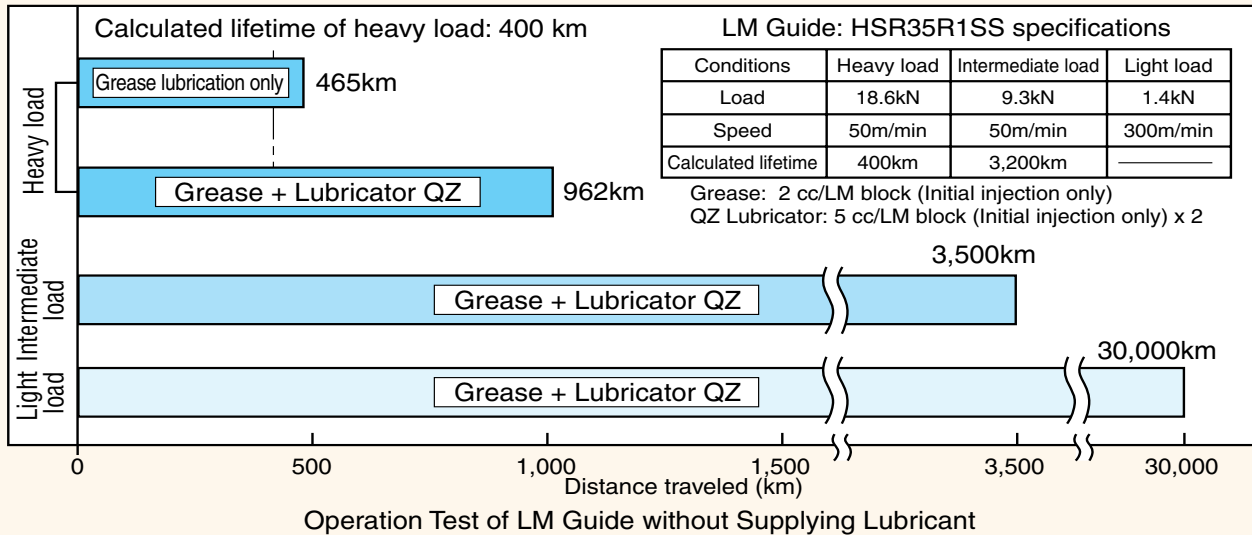
**Application 3** **High-speed Movement**

- 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.

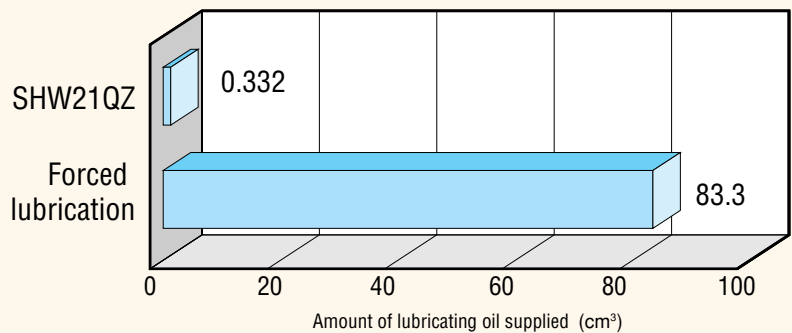


## 2) Effective Utilization of Lubricating Oil

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 5,000 km

Test conditions: 300m/min



Oil content of Lubricator QZ  
 $0.166\text{cm}^3 \times 2 = 0.332\text{cm}^3$

Comparison

Forced lubrication  
 $0.03\text{cm}^3/6 \text{ min} \times 16667 \text{ min} = 83.3\text{cm}^3$

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

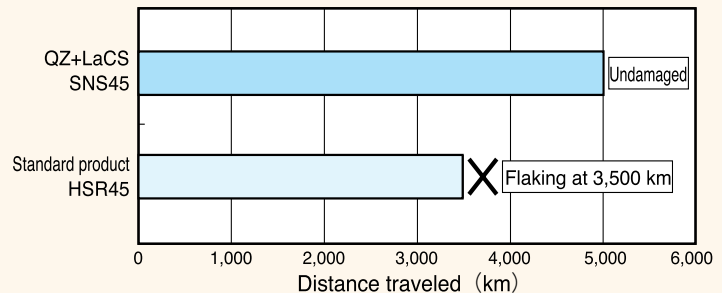
## 3) Lubrication Supportive Effects in Harsh Environments

5,000 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 standard 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 Laminated Contact Scraper LaCS (see page 5).

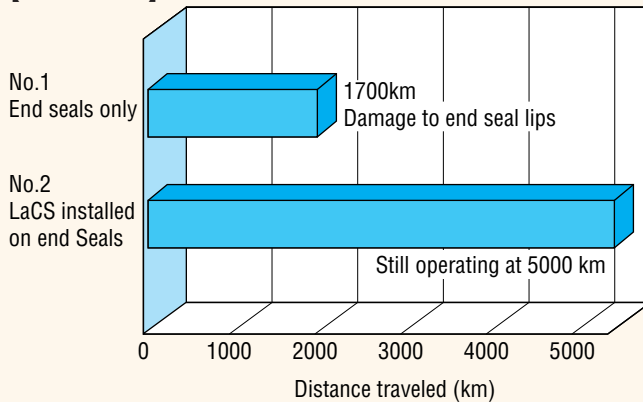
# Performance of the LM Guide Laminated Contact Scraper **LaCS**

## 1) Testing in Water-Soluble Coolant Environment

【Test Conditions】

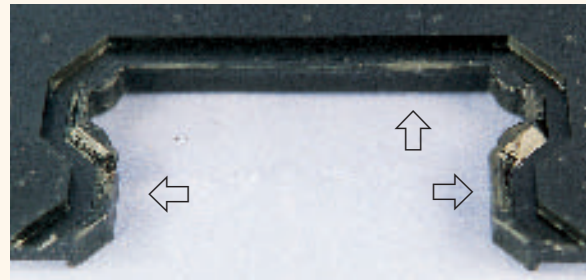
Item	Description	
Sample	No.1	SHS45R1SS+3000L (end seals only)
	No.2	SHS45R1SSH+3000L(LaCS installed on end seals)
Max. speed	200m/min	
Environmental conditions	Coolant application cycle: 5 times/day	

【Test Results】



### Enlarged Photograph of End Seal Lip

No.1 : End seals only: Damaged lip at 1700 km



Arrows indicated damaged areas

No.2 : LaCS installed on end seals: No abnormalities after traveling 5000 km



No damage to the lip

## 2) Testing in Microscopic Foreign Matter Environment

【Test Conditions】

Item	Description	
Sample	No.1	SNR45R1DD+600L (installed with double 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 smaller conditions)	
	Amount applied: 1g/hr (total amount applied: 120 g)	

【Test Results】 Amount of Foreign Matter on Rolling Surfaces

Seal configuration	Sample	Amount of foreign matter on rolling surfaces [g]
Conventional dustproofing specifications Double seal specifications (two superimposed end seal structures)	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 only)



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

NO.2 After Traveling 100 km (LaCS only)

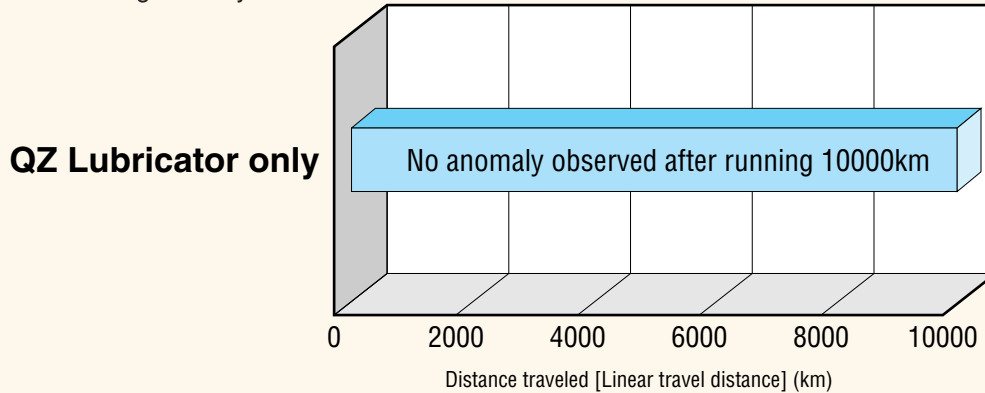


Foreign matter is confirmed to be absent on ball rolling surfaces.

# Performance of the Ball Screw Lubricator QZ

## 1) Significantly extended maintenance interval

Since QZ Lubricator continuously feeds a lubricant over a long period, the maintenance interval can be extended significantly.

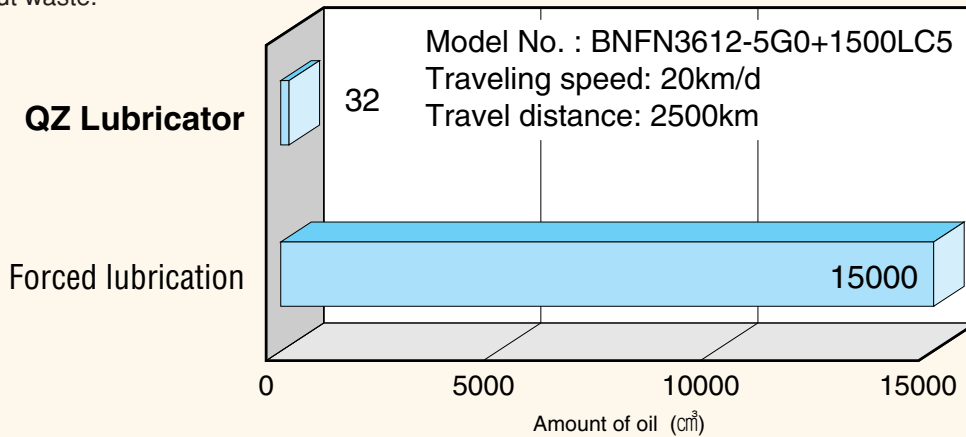


[Test conditions]

Item	Description
Ball Screw	BIF2510
Maximum rotational speed	2500min <sup>-1</sup>
Maximum speed	25m/min
Stroke	500mm
Load	Internal preload only

## 2) Environmentally friendly lubrication system

Since QZ Lubricator feeds the right amount of lubricant directly to the raceway, the lubricant can effectively be used without waste.



**QZ Lubricator + THK AFA Grease**

32cm<sup>3</sup>

(QZ Lubricator attached to both ends of the ball screw nut)

Compared

**Forced lubrication**

0.25cm<sup>3</sup>/3min × 24h × 125d

= 15000cm<sup>3</sup>

Reduced to approx.  $\frac{1}{470}$

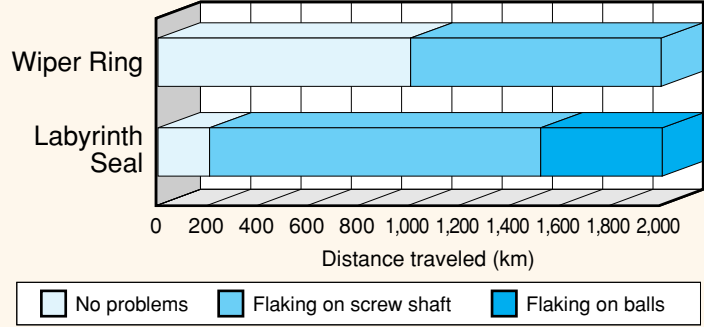
# Performance of the Ball Screw Wiper Ring **W**

## 1) Testing in a Foreign Matter Environment

[Test Conditions]

Item	Description
Type	BIF3210-5G0+1500LC5
Max. rotational speed	1,000min <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 ball screw nut only
Cast powder	FCD400, mean particle size: 250μm
Amount of foreign matter per shaft	5g/h

[Test Results]

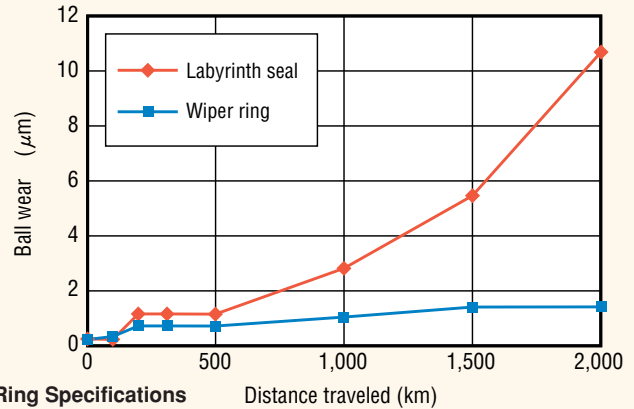
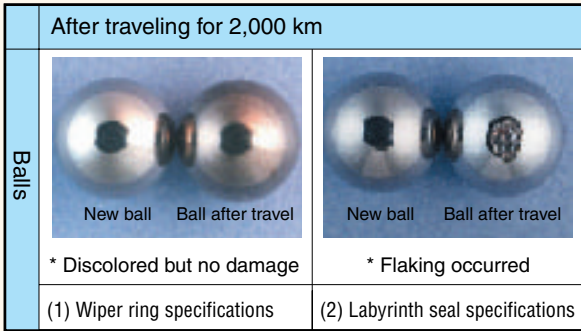


(1) Wiper Ring Specifications

Slight flaking occurred on the ball screw after traveling 1,000 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 1,500 km.



(1) Wiper Ring Specifications

The amount of ball wear was 1.4 μm after traveling 2,000 km.

(2) Labyrinth Seal Specifications

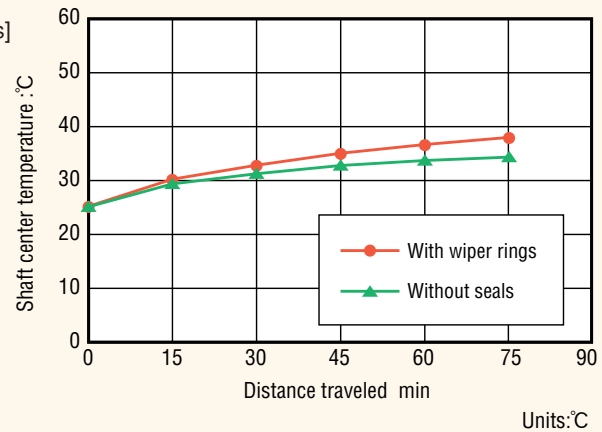
Wear proceeded rapidly starting at 500 km, and the amount of ball wear was 11 μm after traveling 2,000 km.

## 2) Heat Generation Test

[Test Conditions]

Item	Description
Type	BLK3232DG0+1426LC5
Max. rotational speed	1,000min <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 ball screw 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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