

6. Selection According to the Service Environment

6.1. Lubrication

When using an LM system, it is necessary to adequate effective lubrication. Without lubrication, the rolling elements or the raceway may be worn faster and the service life may be shortened.

A lubricant has effects such as the following.

- ① Minimizes friction in moving elements to prevent seizure and reduce wear.
- ② Forms an oil film on the raceway to decrease stress acting on the surface and extend rolling fatigue life.
- ③ Covers the metal surface to prevent rust formation.

To fully bring out an LM system's functions, it is necessary to provide lubrication according to the service conditions.

Even with an LM system with seals, the internal lubricant gradually spills out during operation. Therefore, the system needs to be lubricated at an appropriate interval according to the service conditions.

6.1.1. Types of Lubricants

LM systems mainly use grease or sliding surface oil for their lubricants.

The requirements that lubricants need to satisfy generally consist of the following.

- ① High oil film strength
- ② Small friction
- ③ High wear resistance
- ④ High thermal stability
- ⑤ Non corrosive
- ⑥ Highly rust preventive
- ⑦ Minimum dust/water content
- ⑧ Consistency of grease must not be altered to a significant extent even after it is repeatedly stirred.

Lubricants that meet these requirements include the following products.

Grease Lubrication

Greasing intervals vary depending on the service conditions and service environments. For normal use, we recommend greasing the system approximately every 100 km of travel distance.

Normally, replenish grease of the same group from the grease nipple or greasing hole provided on the LM system. Mixing different types of grease may deteriorate the system's performance, such as increased consistency.

Oil Lubrication

LM systems that require oil lubrication are shipped with only anticorrosive oil applied. When placing an order, specify the required lubricant oil. If the LM system is to be mounted other than in horizontal orientation, part of the raceway may poorly be lubricated. Therefore, be sure to inform us of the mounting orientation of the LM system (for details on mounting orientations, see page A-36).

- The amount of oil to be supplied varies with stroke length. For a long stroke, increase the lubrication frequency or the amount of oil so that an oil film reaches the stroke end of the raceway.
- In environments where a liquid coolant is spattered, the lubricant will be mixed with the coolant, and this can result in the lubricant being emulsified or washed away, causing significantly degraded lubrication performance. In such settings, apply a lubricant with high viscosity (kinematic viscosity: approx. 68 cst) and high emulsification resistance, and adjust the lubrication frequency or the amount of the feed lubricant.
For machine tools and similar devices that are subject to heavy loads and require high rigidity and operate at high speed, it is advisable to apply oil lubrication.
- Make sure that lubrication oil normally discharges from the ends of your lubrication piping, i.e., the oiling ports that connect to your LM system.

Table 1 Lubricants for General Use

Lubricant	Type	Brand name
Grease	Lithium-based grease (JIS No. 2) Urea-based grease (JIS No. 2)	*) AFB-LF Grease (THK) Albania Grease No. 2 (Showa-Shell) Daphne Exponex Grease No. 2 (Idemitsu) or equivalent
Oil	Sliding surface oil or turbine oil ISOVG32~68	Super Multi 32 to 68 (Idemitsu) Vactra No. 25 (ExxonMobil) DT Oil (ExxonMobil) Tonna Oil (Showa-Shell) or equivalent

For products marked with "**", see page A-117.

6.1.2. Lubrication under Special Environments

For use under special conditions, such as continual vibrations, clean room, vacuum, low temperature and high temperature, normal grease may not be used in some cases. For lubricants that meet such conditions, contact **THK**.

Table 2 Lubricants Used under Special Environments

Service environment	Lubricant characteristics	Brand name
High-speed moving parts	Grease with low torque and low heat generation	*) AFG Grease (THK) *) AFA Grease (THK) NBU 15 (NOK-KLUBER) Multemp (Kyodo Yushi) or equivalent
Vacuum	Fluorine-based vacuum grease or oil (vapor pressure varies by brand) Note 1	Fomblin Grease (Solvay Solexis) Fomblin Oil (Solvay Solexis) Barrierta IEL/V (NOK-KLUBER) Isoflex (NOK-KLUBER) Krytox (Dupont)
Clean rooms	Grease with very low dust generation	*) AFE Grease (THK) *) AFF Grease (THK) (The above vacuum grease products also applicable.)
Environments subject to microvibrations or microstrokes, which may cause fretting corrosion	Grease that easily forms an oil film and has high fretting resistance	*) AFC Grease (THK)
Environments subject to a spattering coolant such as machine tools	Highly anticorrosive, refined mineral oil or synthetic oil that forms a strong oil film and is not easily emulsified or washed away by coolant Water-resistant grease Note 2	Super Multi 68 (Idemitsu) Vactra No 2S (ExxonMobil) or equivalent
Mist lubrication	Oil that can easily be atomized and offers superb lubricity.	

For items marked with "**", see pages A-117 and A-125.

Note 1: When using a vacuum grease, be sure that some brands have starting resistances several times greater than ordinary lithium-based greases.

Note 2: In an environment subject to a spattering water-soluble coolant, some brands of intermediate viscosity significantly decrease their lubricity or do not properly form an oil film. Check the compatibility between the lubricant and the coolant.

Note 3: Do not mix greases with different physical properties.

6.1.3. Lubrication Methods

There are roughly three methods of lubricating LM systems: manual lubrication using a grease gun or manual pump; forced lubrication using an automated pump; and oil-bath lubrication.

Manual Lubrication

Generally, grease is replenished periodically, fed through a grease nipple provided on the LM system, using a grease gun (Fig. 1).

For systems that have many locations to be lubricated, establish a centralized piping system and periodically provide grease from a single point using a manual pump (Fig. 2).

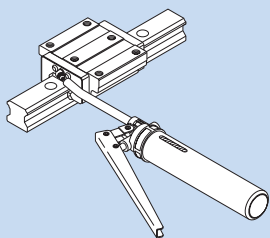


Fig. 1 Lubrication using a Grease Gun

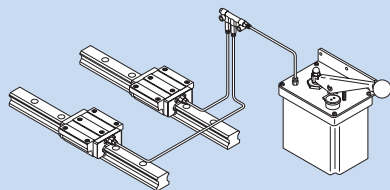


Fig. 2 Lubrication through a Centralized Piping System

Note 1: When a centralized piping system is used, lubricant may not reach the pipe end due to the viscous resistance inside the pipe. Select the right type of grease while taking into account the consistency of the grease and the pipe diameter.

Forced Lubrication

In this method, a given amount of lubricant is forcibly fed at a given interval. Normally, the lubricant is not collected after use (Fig. 3).

Although a special lubrication system using a piping or the like needs to be designed, this method reduces the likelihood of forgetting to replenish lubricant.

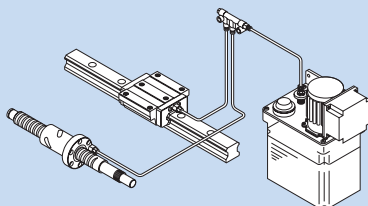


Fig. 3 Forced Lubrication Method

This method is used mainly for oil lubrication. If using grease, it is necessary to examine the appropriate piping diameter and the required grease consistency.

● **THK Mist Lubrication**

Unlike conventional mist lubrication, **THK** Mist Lubrication feeds micron-size lubricant mist in a constant and accurate rate through electronic control. Therefore, the interior of LM blocks and Ball Screws is uniformly lubricated. Such electronic control minimizes the adverse effects of oil temperature, ambient temperature and viscosity that are common in conventional mist lubrication. Leakage to the atmosphere is minimal as well. Also the mist and air cool the subject system and thus inhibits heat generation resulting from high-speed motion. Since coolant and other contaminants are unlikely to invade the lubrication unit, **THK** Mist Lubrication is highly suitable in harsh environments (Fig. 4).

Note 2: Some types of lubricant are difficult to atomize. Contact **THK** for details.

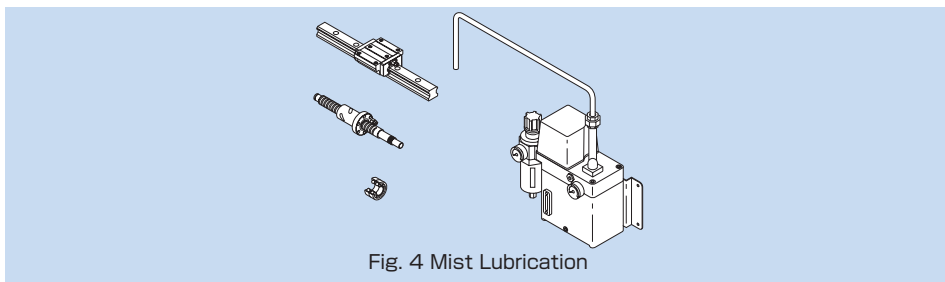


Fig. 4 Mist Lubrication

● **THK Grease Gun Unit MG70**

Grease Gun Unit MG70 is capable of lubricating small to large types of LM Guides by replacing dedicated nozzles. For small LM Guides, MG70 is provided with dedicated attachments. The user can select from these attachment according to the model number and the installation space.

MG70 has a slit window, allowing the user to check the remaining amount of grease.

It is equipped with a bellows-type cartridge that can hold 70 g of grease and is replaceable without smirching your hand. It supports a wide range of grease products, including AFA Grease, AFB-LF Grease, AFC Grease and AFE Grease, to meet varied service conditions. This enables you to make a selection according to the area requiring grease (see pages A-117 to 125).

Table 3 Specifications of the Grease Gun

Discharge pressure	19.6 MPa max
Discharge rate	0.6 cc/stroke
Grease	70 g bellows cartridge
Overall length	235 mm (excluding the nozzle)
Weight	480 g (including the nozzle; excluding grease)

Table 4 Supported Model Numbers

Type N	LM Guides...Models SSR15, SHS15, SR15, HSR12, HSR15, CSR15, HRW17, GSR15, RSR15, RSH15, HCR12 and HCR15 Cam Followers...Models CF, CFN and CFH Rod Ends...Models PHS5 to 22, RBH and POS8 to 22
Type P	Models HSR8, HSR10, HRW12, HRW14, RSR12 and RSH12
Type L	Models HSR8, HSR10, HRW12, HRW14, RSR12 and RSH12
Type H	LM Guides (models with grease nipple M6F or PT1/8) Ball Screws Rod Ends...Models PHS25, PHS30, POS25 and POS30

Note: Types P and L are also capable of greasing less accessible areas other than the model numbers above (by dropping grease on the raceway).



Grease Gun Unit MG70

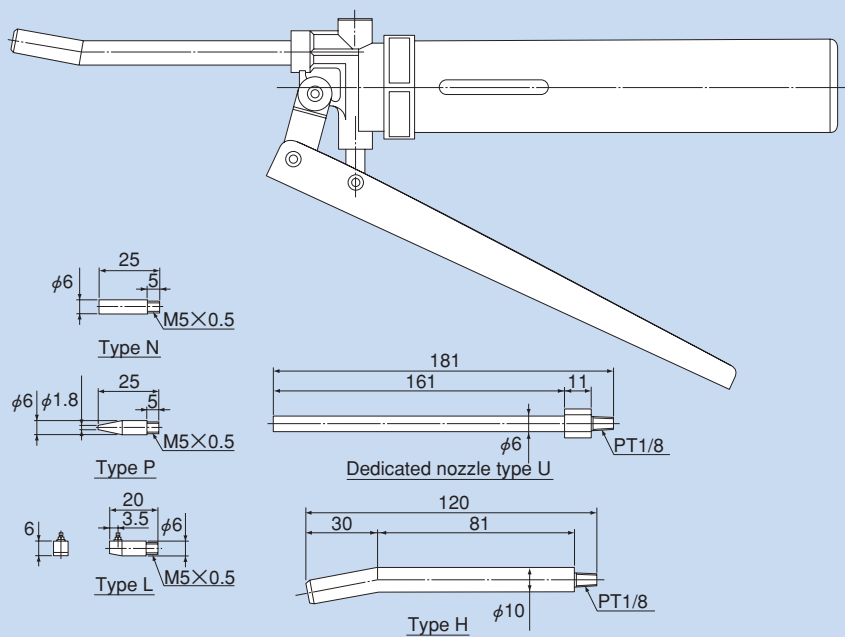
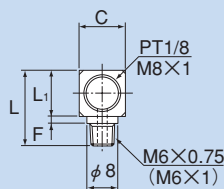


Fig. 5 Grease Gun Unit MG70

6.1.4. Accessories for Lubrication

Special Plumbing Fixtures

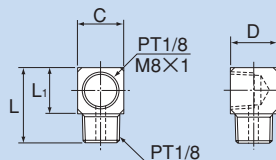
For centralized greasing and oil lubrication, special plumbing fixtures are available from **THK**. When ordering an LM system, specify the model number, mounting orientation and piping direction. We will ship the LM system attached with the corresponding fixture.



LF-A (PT1/8) L=20, L₁=12, F=2, C=12, D=12

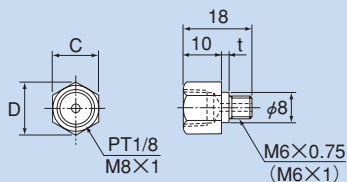
LF-B (M8 x 1) L=18.5, L₁=10, F=2.5, C=9.5, D=18

(LF-E (PT1/8): the same size with LF-A; mounting screw: M6 x 1)



LF-C (PT1/8) L=20, L₁=12, C=12, D=12

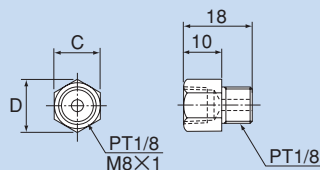
LF-D (M8 x 1) L=18, L₁=10, C=10, D=18



SF-A (PT1/8) t=2, C=12, D=13.8

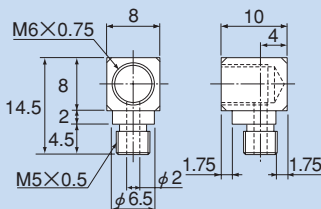
SF-B (M8 x 1) t=2, C=10, D=11.5

(SF-E (PT1/8): the same size with SF-A; mounting screw: M6 x 1)



SF-C (PT1/8) C=12, D=13.8

SF-D (M8x1) C=10, D=11.5



LD (M6 x 0.75)

Fig. 6 Special Plumbing Fixtures

Grease Nipples

THK provides various types of grease nipples needed for the lubrication of LM systems.

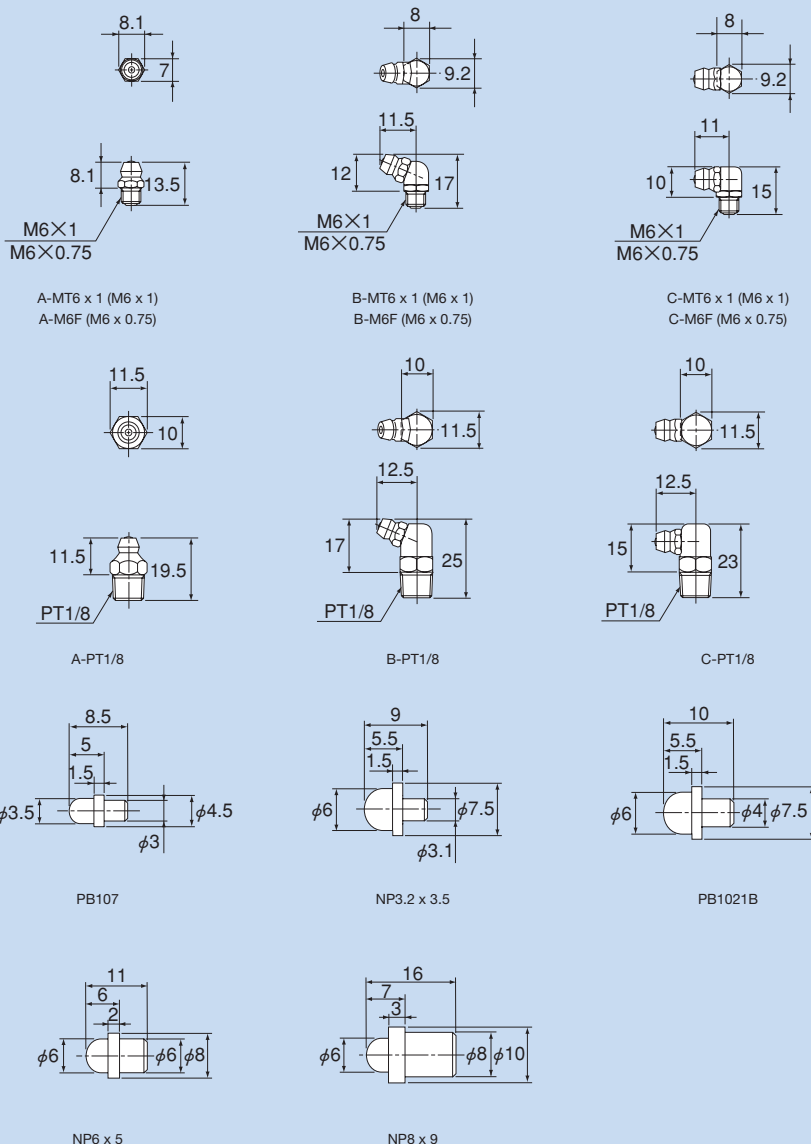


Fig. 7 Grease Nipples

6.1.5. THK Original Grease

AFA Grease

AFA Grease is a high-grade, long-life grease developed with a urea-based consistency enhancer using a high-grade synthetic oil as the base oil.

● Features

① Long service life

Unlike ordinary metal soap-based greases, AFA Grease excels in anti-oxidation stability and therefore can be used for a long period of time.

② Wide temperature range

The lubricating performance remains high over a wide range of temperatures from -45°C to $+160^{\circ}\text{C}$.

Even at low temperatures, AFA Grease requires only a low starting torque.

③ High water resistance

AFA Grease is less vulnerable to moisture penetration than other types of grease.

④ High mechanical stability

AFA Grease is not easily softened even when used for a long period of time.

● Representative Physical Properties

Test item	Representative value	Test method
Worked penetration (25°C, 60W)	285	JIS K 2220 5.3
Dropping point : °C	261	JIS K 2220 5.4
Copper plate corrosion (100°C, 24h)	Accepted	JIS K 2220 5.5
Evaporation : mass% (99°C, 22h)	0.2	JIS K 2220 5.6
Oil separation rate : mass% (100°C, 30h)	0.5	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	0.08	JIS K 2220 5.8
Mixing stability (100,000W)	329	JIS K 2220 5.11
Resistance to removal of grease during the water rinse : mass% (38°C, 1h)	0.6	JIS K 2220 5.12
Low-temperature torque : N·m (-20°C)	Start 0.17	JIS K 2220 5.14
	Rotation 0.07	
Anticorrosive test : (52°C, 48h)	Accepted	ASTM D1743
Service temperature range (°C)	-45 to 160	—

AFB-LF Grease

AFB-LF Grease is a general-purpose grease developed with a lithium-based consistency enhancer using refined mineral oil as the base oil. It excels in extreme pressure resistance and mechanical stability.

● Features

① High extreme pressure resistance

Compared with lithium-based greases available on the market, AFB-LF Grease has higher wear resistance and outstanding resistance to extreme pressure.

② High mechanical stability

AFB-LF Grease is not easily softened and demonstrates excellent mechanical stability even when used for a long period of time.

③ High water resistance

AFB-LF Grease is a highly water resistant grease that is less vulnerable to moisture penetration and little decreases resistance to extreme pressure.

● Representative Physical Properties

Test item	Representative value	Test method
Worked penetration (25°C, 60W)	275	JIS K 2220 5.3
Dropping point : °C	193	JIS K 2220 5.4
Copper plate corrosion (100°C, 24h)	Accepted	JIS K 2220 5.5
Evaporation : mass% (99°C, 22h)	0.36	JIS K 2220 5.6
Oil separation rate : mass% (100°C, 24h)	0.6	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	0.015	JIS K 2220 5.8
Mixing stability (100,000W)	335	JIS K 2220 5.11
Timken load capacity : N	45	JIS K 2220 5.16
Resistance to removal of grease during the water rinse : mass% (38°C, 1h)	1.8	JIS K 2220 5.12
Anticorrosive test : (52°C, 48h)	Accepted	ASTM D1743
Service temperature range (°C)	-15 to 100	—

AFC Grease

AFC Grease has high fretting-corrosion resistance due to a special additive and a urea-based consistency enhancer using a high-grade synthetic oil as the base oil.

●Features

① High fretting-corrosion resistance

AFC Grease is designed to be highly effective in preventing fretting corrosion.

② Long service life

Unlike ordinary metal soap-based greases, AFC Grease excels in anti-oxidation stability and therefore can be used for a long period of time. As a result, maintenance work is reduced.

③ Wide temperature range

Since a high-grade synthetic oil is used as the base oil, the lubricating performance remains high over a wide range of temperatures from -54°C to +177°C.

●Representative Physical Properties

Test item	Representative value	Test method
Worked penetration (25°C, 60W)	288	JIS K 2220 5.3
Dropping point : °C	269	JIS K 2220 5.4
Copper plate corrosion (100°C, 24h)	Accepted	JIS K 2220 5.5
Evaporation : mass% (177°C, 22h)	7.9	JIS K 2220 5.6
Oil separation rate : mass% (177°C, 30h)	2	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	0.065	JIS K 2220 5.8
No. of contaminants, 25 to 75μm	370	JIS K 2220 5.9
pieces/cm ³ 75μm or more	0	
Mixing stability (100,000 W)	341	JIS K 2220 5.11
Resistance to removal of grease during the water rinse : mass% (38°C, 1h)	0.6	JIS K 2220 5.12
Low-temperature torque : N·m (-54°C)	Start 0.63	JIS K 2220 5.14
	Rotation 0.068	
Anticorrosive test : (52°C, 48h)	Accepted	ASTM D1743
Vibration test (200h)	Accepted	—
Service temperature range (°C)	-54 to 177	—

●Test Data on Fretting-corrosion Resistance

Due to its superior ingredients (urea-based consistency enhancer), high-grade synthetic oil and a special adhesive, AFC Grease provides high fretting-corrosion resistance.

The test data in Fig. 8 shows the result of comparing AFC Grease with an ordinary bearing grease.

Test conditions	
Item	Description
Stroke	3mm
No. of strokes per min	200min ⁻¹
Total No. of strokes	2.88×10 ⁵ (24 hours)
Surface pressure	1118MPa
Amount of fed grease	12 g/LM block (replenished every 8 hours)

● Comparison of Raceway Conditions

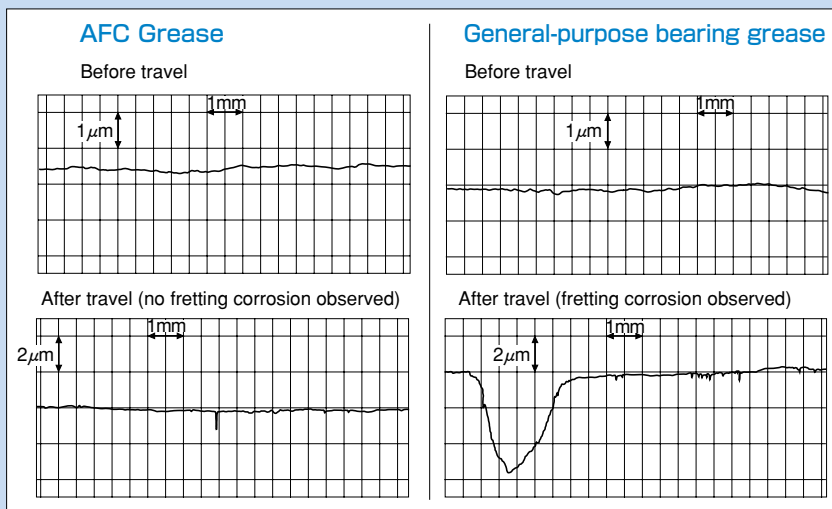


Fig. 8 Test Data on AFC Grease

AFE Grease

AFE Grease uses urea as a consistency enhancer and a high-grade synthetic oil as the base oil. It has low dust-generative characteristics and is therefore a suitable grease for clean room environments.

● Features

① Low dust generation

Compared with vacuum greases in conventional use, AFE Grease generates less dust and therefore is ideal for use in clean rooms.

② Long service life

Unlike ordinary metal soap-based greases, AFE Grease excels in anti-oxidation stability and therefore can be used for a long period of time. As a result, maintenance work is reduced.

③ Wide temperature range

The lubricating performance remains high over a wide range of temperatures from -40°C to +200°C.

④ High chemical stability

AFE Grease has high resistance to chemicals, NO_x and radiation.

● Representative physical properties

Test item	Representative value	Test method
Appearance	Light brown, viscous	—
Consistency enhancer	Urea	—
Base oil	Synthetic oil	—
Worked penetration (25°C, 60W)	280	JIS K 2220 5.3
Dropping point : °C	260<	JIS K 2220 5.4
Oil separation rate : mass% (150°C, 24h)	1.8	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	10 (0.1)	JIS K 2220 5.8
Bearing rust prevention : (52°C, 48h)	#1	ASTM D1743
Base oil kinematic viscosity (100°C)	12.8 (12.8)	—
Service temperature range (°C)	-40 to 200	—

● Test Data on Low Dust Generation

Due to its high chemical stability and superior ingredients (urea-based consistency enhancer and high-grade synthetic oil), AFE Grease generates little dust.

The test data in Fig. 9 shows the result of comparing dust accumulation between AFG Grease with another grease.

Test conditions	
Item	Description
Sample model No.	THK KR4610
Screw Ball rotational speed	1000min ⁻¹
Strokes	210mm
Amount of fed grease	2cc in both the Ball Screw and the LM Guide
Flow rate during measurement	1 ℓ /min
Measuring instrument	Dust counter
Dust particle diameter	0.5 μm

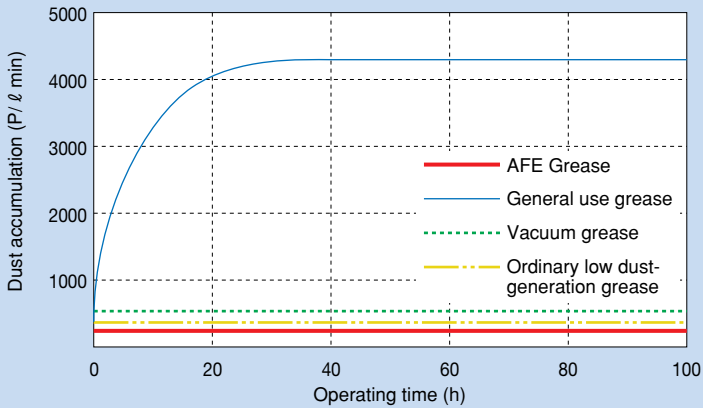


Fig. 9 Test Data on Dust Generation with AFE Grease

AFF Grease

THK AFF Grease uses a high-grade synthetic oil, lithium-based consistency enhancer and a special additive. It achieves stable rolling resistance, low dust generation and high fretting-corrosion resistance, at a level that conventional vacuum greases or low dust-generation greases have not reached.

●Features

① Stable rolling resistance

Since the viscous resistance is low, the rolling resistance fluctuation is also low. Thus, superb conformity is achieved at low speed.

② Low dust generation

AFF Grease generates little dust, making itself and ideal grease for use in clean rooms.

③ Fretting-corrosion resistance

Since AFF Grease is highly resistant to wear from microvibrations, it allows the lubrication interval to be extended.

●Representative physical properties

Test item	Representative value	Test method
Worked penetration (25°C, 60W)	315	JIS K 2220 5.3
Dropping point : °C	216	JIS K 2220 5.4
Copper plate corrosion (100°C, 24h)	Accepted	JIS K 2220 5.5
Evaporation : mass% (99°C, 22h)	0.43	JIS K 2220 5.6
Oil separation rate : mass% (100°C, 24h)	0.57	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	39	JIS K 2220 5.8
No. of contaminants, 25 μm or more pieces/cm ³	0	JIS K 2220 5.9
75 μm or more	0	
125 μm or more	0	
Mixing stability (100,000 W)	329	JIS K 2220 5.11
Low temperature torque : N·m (−20°C)	Start	JIS K 2220 5.14
	Rotation	
Apparent viscosity : Pa·s (−10°C, 10S ^{−1})	3400	JIS K 2220 5.15
Timken load capacity : N	88.2	JIS K 2220 5.16
4-ball testing (burn-in load) : N	3089	ASTM D2596
Fretting-corrosion resistance : mg	3.8	ASTM D4170 compliant
Bearing rust prevention : (52°C, 48h)	#1	ASTM D1743
Service temperature range (°C)	−40 to 120	—

●Rolling Resistance Characteristics at Low Speed

The data in Fig. 10 represent the test results of comparing rolling resistances at low speed between AFF Grease and other greases.

Test conditions	
Item	Description
Model No.	HSR35RC0+440LP
Grease quantity	4 cm ³ /LM block (initial lubrication only)
Feed speed	1mm/s
Stroke	3mm

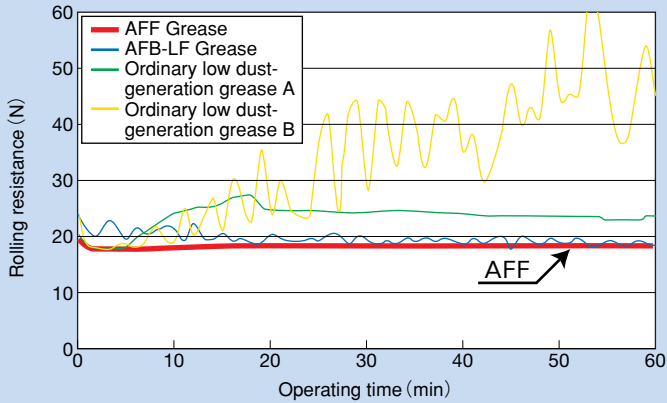


Fig. 10 Rolling Resistance at Low Speed

AFG Grease

THK AFG Grease is a high-grade grease for Ball Screws that uses a high-grade synthetic oil as the base oil and a urea-based consistency enhancer. It excels in low heat generation and supports a wide temperature range from low to high temperature.

● Features

① Low heat generation

Since the viscous resistance is low, the grease generates only a minimal level of heat even during high-speed operation.

② Low viscosity

Since the viscosity is low, a stable rotation torque is achieved.

③ Wide temperature range

Maintains a high level of lubricity in a wide temperature range of -45°C to +160°C.

④ Long service life

AFG Grease is not easily softened and excels in stability in oxidation even after a long-term operation.

⑤ Water resistance

AFG Grease is a highly water resistant grease that is less vulnerable to moisture penetration and little decreases resistance to extreme pressure.

● Representative Physical Properties

Test item	Representative value	Test method
Worked penetration (25°C, 60W)	285	JIS K 2220 5.3
Dropping point : °C	261	JIS K 2220 5.4
Copper plate corrosion (100°C, 24h)	Accepted	JIS K 2220 5.5
Evaporation : mass% (99°C, 22h)	0.2	JIS K 2220 5.6
Oil separation rate : mass% (100°C, 24h)	0.5	JIS K 2220 5.7
Stability of oxidation : MPa (99°C, 100h)	0.029	JIS K 2220 5.8
Mixing stability (100,000 W)	329	JIS K 2220 5.11
Resistance to removal of grease during the water rinse : mass% (38°C, 1h)	0.6	JIS K 2220 5.12
Low-temperature torque : N·m (-20°C)	Start	0.439
	Rotation	0.049
Anticorrosive test : (52°C, 48h)	1,1,1	ASTM D1743
Service temperature range (°C)	-45 to 160	—

Test data on heat generation	
Item	Description
Shaft diameter	32/10mm
Feed speed	67 to 500 mm/s
Shaft rotation speed	400 to 3000 min ⁻¹
Stroke	400mm
Grease quantity	12cm ³
Temperature measurement point	Nut circumference

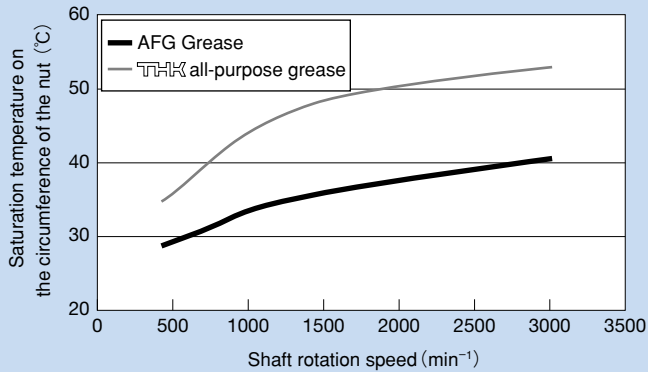


Fig. 11 Test Data on Heat Generation with AFG Grease

Model number coding

AFA Grease, AFB-LF Grease, AFC Grease,
AFE Grease, AFF Grease and AFG Grease

AFC+400
1 2

1 Type of grease 2 Cartridge capacity (400 g / 70 g)

- Type of packing: bellows cartridge
- Cartridge grease content

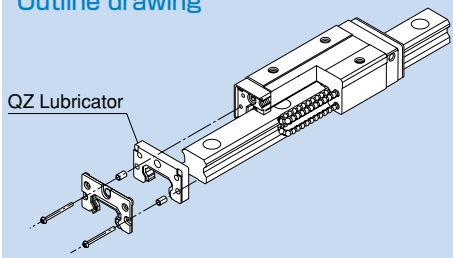
Grease capacity	AFA Grease	AFB-LF Grease	AFC Grease	AFE Grease	AFF Grease	AFG Grease
400g	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
70g	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6.1.6. QZ Lubricator™ for the LM Guide®

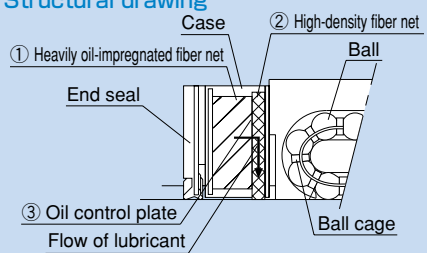
QZ Lubricator feeds the right amount of lubricant to the ball raceway on the LM rail. This allows an oil film to continuously be formed between the balls and the raceway, and drastically extends the lubrication and maintenance intervals.

The structure of QZ Lubricator consists of three major components: ① a heavy oil-impregnated fiber net (function to store lubricant), ② a high-density fiber net (function to apply lubricant to the raceway) and ③ an oil-control plate (function to adjust oil flow). The lubricant contained in QZ Lubricator is fed by the capillary phenomenon, which is used also in felt pens and many other products, as the fundamental principle.

Outline drawing



Structural drawing



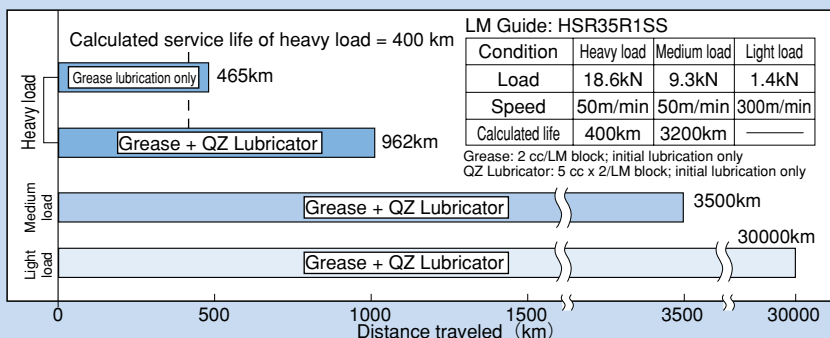
Features

- Supplements lost oil to drastically extend the lubrication/maintenance interval
- Eco-friendly lubrication system that does not contaminate the surrounding area since it feeds the right amount of lubricant to the ball raceway.
- The user can select a type of lubricant that meets the intended use.

Note: For models that support QZ Lubricator, see the sections corresponding to the model numbers in the "THK General Catalog - Product Specifications," provided separately.

Significant Extension of the Maintenance Interval

Attaching QZ Lubricator helps extend the maintenance interval throughout the whole load range from the light-load area to the heavy-load area.



LM Guide Running Test without Replenishment of Lubricant

Effective Use of Lubricant

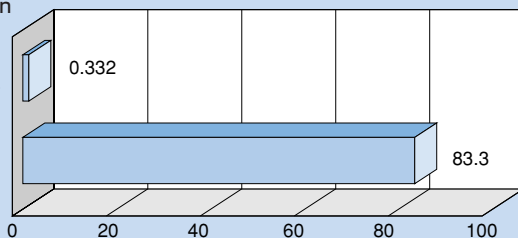
Since the lubricator feeds the right amount of lubricant to the ball raceway, lubricant can be used efficiently.

[Test conditions] speed: 300 m/min

Comparison of
lubricant consump-
tion after traveling
5,000 km

SHW21QZ

Forced
lubrication



Supplied amount of lubricant cm³

Amount of oil contained in QZ Lubricator
0.166 cm³ x 2 units (attached to both
ends of the LM block)
= 0.332 cm³

Compared

Forced lubrication
 $0.03\text{cm}^3/6\text{min} \times 16667\text{min}$
= 83.3 cm³

Lubricant consumption is 1/250 less than forced lubrication.

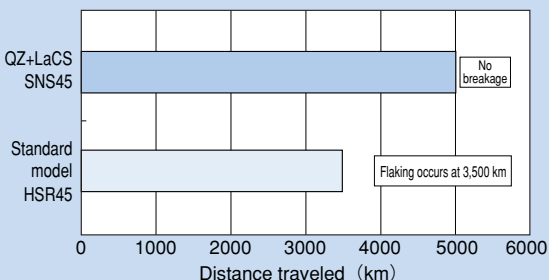
Effective in Helping Lubrication under Harsh Environments

A 5,000 km durability test was conducted under harsh environments (containing coolant and foreign matter).

[Test conditions]

Model No.	SNS45	HSR45
Load	8kN	6kN
Speed	60m/min	
Coolant	Immersed 48 hrs, dried 96 hrs	
Foreign matter	Foundry dust (125 μm or less)	
Lubri- cation	AFA Grease + QZ	Super Multi 68 Oiling cycle: 0.1cc/shot Periodically lubricated every 16 min

[Test result]



* When using the LM system under harsh environment, use QZ Lubricator and Laminated Contact Scraper LaCS (see page A-134) in combination.