



THK Linear Motion System

# Ball Spline

**Instruction Manual**

No. 1030-T34669

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# 1. Introduction

## 1. Introduction

### 1-1 Foreword

Thank you for purchasing this THK product. This manual describes the precautions on use, assembly method, and lubrication method that apply to a Ball Spline.

### 1-2 About This Manual

#### 1-2-1 Intended Audience

Persons in charge of product mounting design, installation, wiring, and maintenance, and persons actually using the product.

#### 1-2-2 Using This Manual

This manual describes the correct handling of this product and precautions on its use. For maximum product performance and long-term use, read this manual carefully and understand its contents so that you use this product safely and properly. When printing this manual for reading, store it in a place where the intended audience can read it when necessary.

#### 1-2-3 Notice and Attention

- Do not handle or use this product in any way other than as described in this manual.
- No part of this manual may be duplicated, reproduced, or loaned without permission.
- Due to a continuing process of product improvement, information contained herein is subject to change without notice.
- Efforts have been made to ensure the accuracy of the information contained herein. If, however, you notice an error or have a concern, notify THK.
- The diagrams contained herein are representative examples and may vary from the actual product.
- THK will not be liable for the effects resulting from the use of this manual for any reason whatsoever.
- This manual also applies to special products, but content specified on the Delivery Specification Diagram takes priority.

\*Special products are products that differ from standard products listed in the catalog, in material and/or specifications.

## 1-3 Applying This Product

- Do not use this product for equipment or systems used in life-threatening situations.
- Consult THK beforehand when considering using this product for special applications such as in passenger vehicles or in medical, aviation and space, nuclear power, or electrical power equipment or systems.
- This product was manufactured under strict quality control, but this does not completely rule out product failure. When using this product in equipment where failure of this product could cause a severe accident or damage, install a safety device or backup device to prevent the occurrence of severe accidents or damage.

## 1-4 Product Support

Efforts have been made to ensure the accuracy of the information contained herein. If, however, you have a concern, notify THK.

## 1-5 Product Information and THK Information

For the latest product information and company information, we recommend that you regularly access and view the THK website.

- Website URL: <https://www.thk.com/eng/>
- Technical support site URL: <https://tech.thk.com/>

## 2. Precautions on Use

### 2-1

### Safety Related Warning Displays

This manual uses the following safety related warning displays. Descriptions containing safety related warning displays are serious and must be followed. The Ball Spline is a precision part, to be handled with care based on the following information.



#### Warning

"A matter which, if mishandled, could result in death or serious injury."



#### Caution

"A matter which, if mishandled, could result in physical injury or material damage."



"Prohibited (never do this)"



"Required (always do this)"

### 2-2

### Handling

#### CAUTION



Handle with care

- Please use at least two people to move any product weighing 20 kg or more, or use a dolly or other conveyance. Failure to do so could cause injury or damage the product.



Do not disassemble

- Do not disassemble the parts. This could impair the product's functions.



Falling objects

- Tilting a spline nut or spline shaft may cause them to fall by their own weight.
- Take care not to drop or strike the Ball Spline. This could cause injury or damage the product. If the product receives an impact, it could impair the product's functions, even if the product looks intact.



Handle with care

- When assembling, be sure not to remove the spline nut from the spline shaft.
- When handling the product, wear safety gloves and safety boots, etc., as appropriate to ensure safety.

## 2. Precautions on Use

### 2-3

### Precautions on Use

#### CAUTION



Prevent dust

- Prevent foreign materials, such as cutting chips or coolant, from entering the product. Failure to do so could damage the product.
- Prevent foreign materials, such as cutting chips, coolant, corrosive solvents or water from getting in the product by using a bellows or cover when the product is used in an environment where such a thing is likely.
- If foreign materials such as cutting chips adhere to the product, clean the product and then replenish the lubricant.
- Small strokes can inhibit the formation of an oil film between the raceway and the area of contact for rolling elements, resulting in fretting. Therefore, be sure to use a type of grease with high fretting resistance properties. We recommend periodically adding stroke movement for approximately the spline nut length to help ensure that an oil film forms between the raceway and the rolling elements.



Maximum temperature

- Do not use this product if the external temperature exceeds 80 °C. If used in excess of this temperature, there is a risk that the resin and rubber parts may deform or become damaged (except the heat-resistant type).



Handle with care

- Do not forcibly drive a pin, key, or other positioning parts into the product. This could create indentations on the raceway and impair the product's functions.
- If the spline shaft supporting portion and the spline nut become misaligned or tilted, it may substantially shorten the service life. Therefore, be sure to pay sufficient attention to the components that are to be mounted and to the mounting accuracy.
- Inserting the spline nut onto the spline shaft while the rolling elements are removed may cause early damage.
- When installing the spline shaft into the spline nut, identify the matching marks on the spline shaft and the spline nut, and then insert the shaft straight while checking relative positioning. Note that forcibly inserting the shaft may cause balls to fall off. If the spline nut is attached with a seal or given a preload, apply a lubricant to the outer surface of the spline shaft.
- When installing the spline nut into the housing, do not hit the side plate, end cap, or seal; gently insert it using a jig.
- A lack of rigidity and accuracy of mounting components may cause the bearing load to localize, reducing the performance of the bearing significantly. Therefore, consider carefully the rigidity and accuracy of the housing and base, and the strength of the securing bolts.
- If desiring to have a flanged-type Ball Spline additionally machined, such as having a dowel pin hole, contact THK.



Falling objects

- If any of the rolling elements fall from the spline nut, discontinue use and contact THK.

## 2. Precautions on Use

### 2-4

### Lubrication

#### CAUTION



Check lubricant

- Thoroughly remove anti-rust oil and feed lubricant before using the product.
- Do not mix different lubricants. Even grease containing the same type of thickening agent may, if mixed, interact in an adverse manner due to disparate additives or other ingredients.
- When using the product in locations subject to constant vibrations or in special environments such as in clean rooms, vacuums, and under low or high temperatures, be sure to use a lubricant suitable for the specifications and environment.
- When lubricating products that do not feature a grease nipple or oil hole, directly coat the raceway surface with lubricant and perform several warm-up strokes to ensure that the grease permeates the interior.
- Grease consistency can vary depending on the temperature. Please keep in mind that the Ball Spline sliding resistance may be affected by changes in consistency.
- Following greasing, the stirring resistance of the grease can cause the Ball Spline to exhibit increased sliding resistance. Before commencing operation, be sure to run the unit through several warm-up cycles to ensure that the grease is adequately integrated and dispersed.
- Excess grease may spatter immediately after lubrication. Wipe off spattered grease as necessary.
- The properties of the grease deteriorate over time, thereby degrading the lubricity. It is necessary to inspect and apply the grease in accordance with the usage frequency.
- How often grease should be replenished varies depending on the usage conditions and environment. We recommend greasing the system approximately every 100 km traveled (three to six months). Final greasing interval/amount should be set at an actual machine.
- When using oil lubrication, the lubricant may not be distributed throughout the product depending on the installation direction of the Ball Spline. Contact THK for details.

### 2-5

### Storage

Ball splines should be stored horizontally in their original packaging in an indoor location where they are not exposed to abnormally high or low temperatures or high humidity. Please note that if the product has been kept in storage for an extended period of time, the lubricant inside may have deteriorated. Please therefore ensure that you replenish the lubricant before re-use.

### 2-6

### Disposal

The product should be disposed of appropriately as an industrial waste.

# 3. Assembly

## 3. Assembly

### 3-1

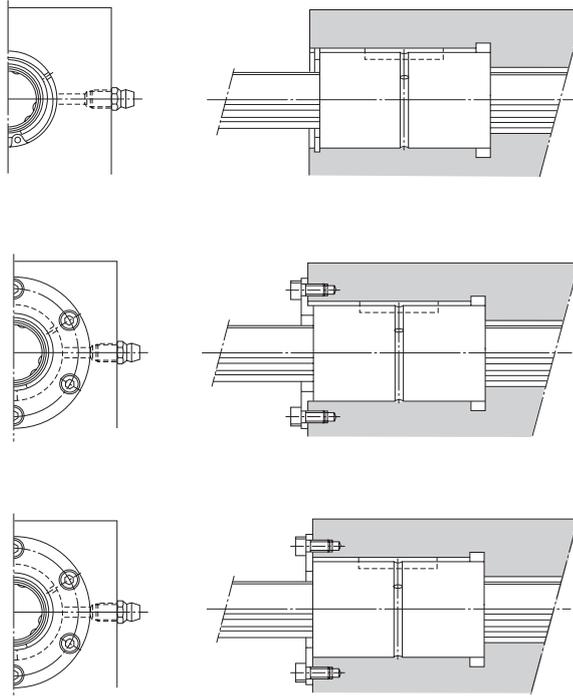
### Mounting the Spline

Figure 3-1 and Figure 3-2 show examples of mounting the spline nut. Although the Ball Spline does not require a large amount of strength for securing it in the spline shaft direction, do not rely only on a press fit to support the nut.

Note: Both ends of the Ball Spline SLS model with a retainer have a resin end cap.

Hammering or forcefully pressing may cause damage. Be careful not to apply an excessive load.

#### Straight outer cylinder

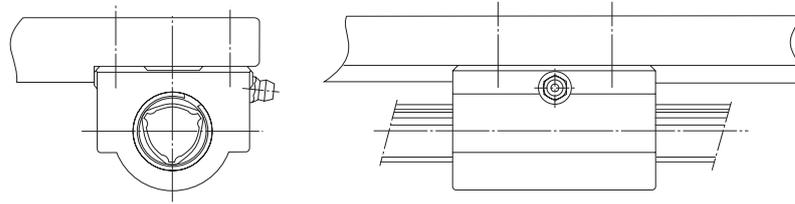


**Figure 3-1 Example of Mounting the Spline Nut**

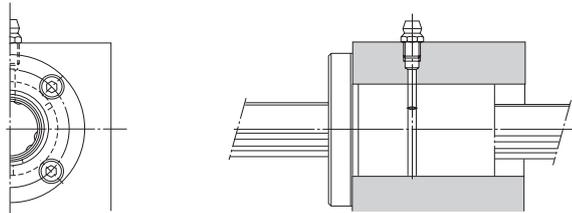
# 3. Assembly

## 3. Assembly

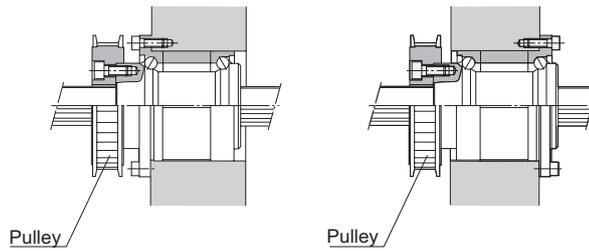
**Model LBH**



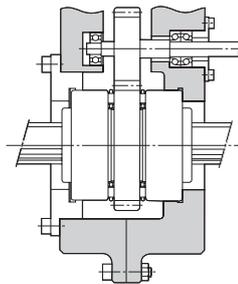
**Flanged Type**



**Model LTR**



**Model LBG**



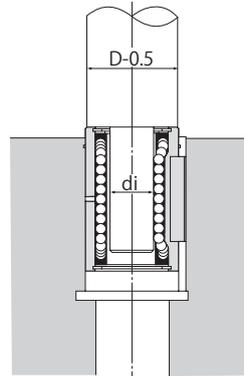
**Figure 3-2 Example of Mounting the Spline Nut**

## 3. Assembly

### 3. Assembly

#### 3-2 Installing the Spline Nut

When installing the spline nut into the housing, do not hit the side plate or the seal; gently insert it using a jig (Figure 3-3).



**Figure 3-3 Installing the Spline Nut**

**Table 3-1 Model LBS Jig Dimensions**

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
di	12.5	16.1	20.3	24.4	32.4	40.1	47.8	55.9	69.3	83.8	103.8	131.8

**Table 3-2 Model LT Jig Dimensions**

Unit: mm

Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100
di	5.0	7	8.5	11.5	14.5	18.5	23	28	37.5	46.5	56	75.5	94.5

## 3. Assembly

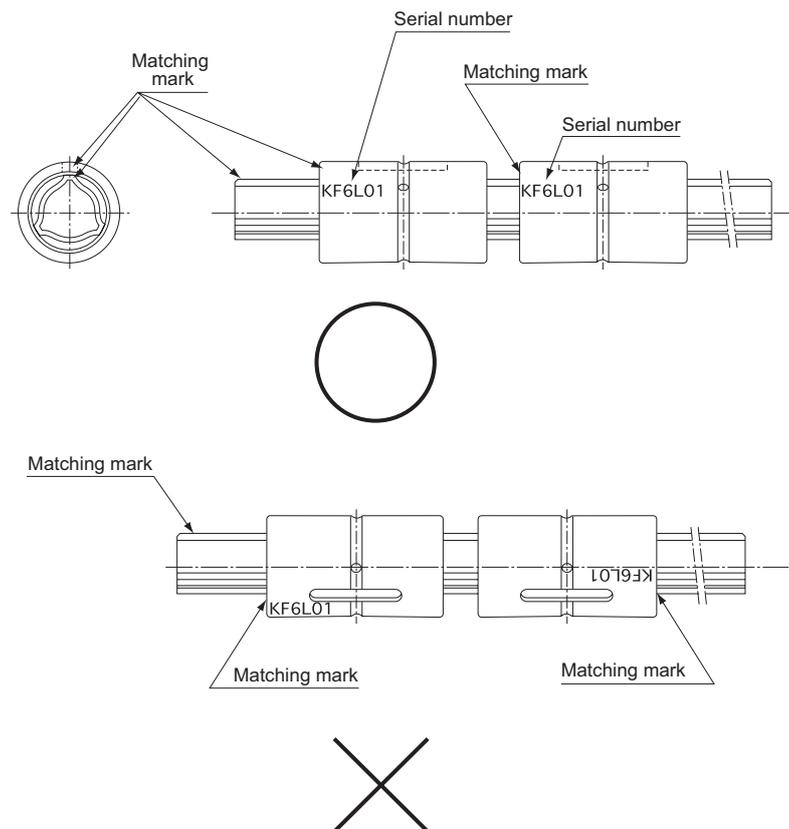
### 3. Assembly

#### 3-3 Installing the Spline Shaft

When installing the spline shaft into the spline nut, identify the matching marks (Figure 3-4) on the spline shaft and the spline nut, and then insert the shaft straight while checking their relative positions.

Note that forcibly inserting the shaft may cause balls to fall off.

If the spline nut is attached with a seal or given a preload, apply a lubricant to the outer surface of the spline shaft.



**Figure 3-4 Installing the Spline Shaft**

## 4. Lubrication

A good quality lubricant is required when using Ball Splines. Usage with no lubrication may increase wear on the rolling elements and shorten the service life.

A lubricant has the following effects.

- (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 in an oil film to prevent rust formation.

To optimize Ball Spline functions, provide lubrication appropriate to the usage conditions.

To prevent foreign material from entering the spline nut and the lubricant from leaking, special synthetic resin seals with high wear resistance are available for the Ball Spline.

Spline nuts with seals (Seal for Both Ends Type UU, and Seal for One End) are sealed with lithium soap-based grease No. 2. If using at high speed or with a long stroke, replenish grease of the same type through the greasing hole on the spline nut after running in.

Afterward, replenish grease of the same type as necessary according to the usage conditions.

The greasing interval differs depending on the usage conditions. Under normal conditions, replenish (or replace) roughly every 100 km of travel distance (three to six months).

For a Ball Spline model type without a seal, apply grease to the interior of the spline nut or to the raceway of the spline shaft.

### 4-1

## Lubrication Interval

### 4-1-1

## Grease Lubrication

How often grease should be replenished varies depending on the usage conditions and environment. We recommend greasing the system approximately every 100 km traveled (three to six months). Final greasing interval/amount should be set at an actual machine.

Normally, relubricate using the same grease type and through the lubrication hole or grease nipple provided on the Ball Spline. Mixing different types of grease may deteriorate the system's performance due to increased consistency or other such factor.

Lubricant	Type	Brand name
Grease	Lithium-Based Grease Urea-Based Grease Calcium-Based Grease	AFA Grease (THK)
		AFB-LF Grease (THK)
		AFC Grease (THK)
		AFE-CA Grease (THK)
		AFF Grease (THK)
		AFG Grease (THK)
		AFJ Grease (THK)
		L100 Grease (THK)
		L450 Grease (THK)
		L500 Grease (THK)
		L700 Grease (THK)
		Alvania Grease S No.2 (Showa Shell Sekiyu)
		Eponex Grease No.2 (Idemitsu Kosan)
		or equivalent

\*The recommended grease will vary according to the usage conditions and environment.

## 4. Lubrication

### 4. Lubrication

#### 4-1-2 Oil Lubrication

LM systems that require oil lubrication are shipped with only anti-rust oil applied. Please indicate when ordering.

- The amount of oil to be applied varies depending on the stroke length. For a long stroke, increase the lubrication frequency or the amount of oil applied so that an oil film is able to form in the stroke end of the raceway.
- In environments where coolant may spatter, the lubricant may become mixed with the coolant. This could result in the lubricant being emulsified or washed away, causing significantly degraded lubrication performance. In such locations, 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 applied lubricant accordingly.
- For machine tools and similar devices that are subject to heavy loads, require high rigidity, and operate at high speed, oil lubrication is recommended.
- Make sure that lubrication oil discharges normally from the ends of the lubrication piping; that is, the oiling ports that connect to your linear motion system.

Lubricant	Type	Brand name
Oil	Raceway Oil or Turbine Oil ISOVG32 to 68	Daphne Super Multi Oil (Idemitsu Kosan)
		Mobil DTE Oil Series (Exxon Mobil)
		Shell Tonna S3 M (Showa Shell Sekiyu)
		Mobil Vactra Numbered Series (Exxon Mobil)
		Mobil Vactra No. 2 SLC (Exxon Mobil)
		or equivalent

# Appendix

## Revision History

The instruction manual number is on the back cover.

Publication Date	Instruction Manual No.	Revisions
December 2017	No. 1030-T34669	First edition

# THK CO., LTD.

## Inquiries

Website URL: <https://www.thk.com/eng/>

Technical support site URL: <https://tech.thk.com/>