Rotary Ball Spline

Support Bearing Types: Model LTR and Model LTR-A

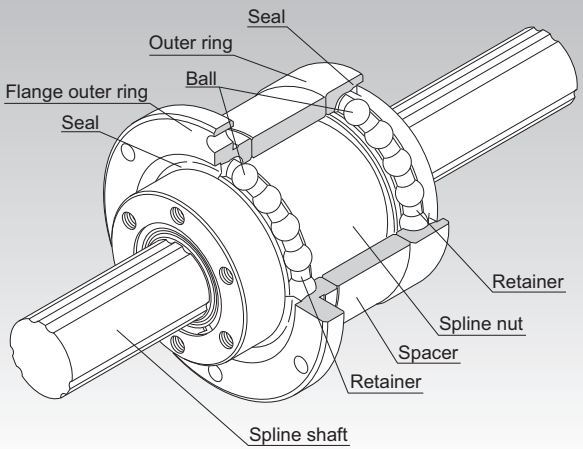


Fig. 1: Structure of Rotary Ball Spline Model LTR

Structure and Features

With the Rotary Ball Spline Model LTR, the spline shaft has three crests on the circumference. Along both sides of each crest, two rows of balls (six rows in total) are arranged to hold the crest so that a reasonable preload is applied.
Angular-contact ball raceways are machined on the outer surface of the spline nut to constitute support bearings, granting the body a compact and light design.
The rows of balls are held in a special resin retainer so that they smoothly roll and circulate. With this design, balls will not fall out even if the spline shaft is removed.
In addition, a dedicated seal for preventing foreign material from entering the support bearings is available.

No Angular Backlash

Two rows of balls provide a preload in an angular-contact structure by holding a crest formed on the circumference of the spline nut from either side at a contact angle of 20°. This eliminates an angular backlash in the rotational direction and increases the rigidity.

Compact Design

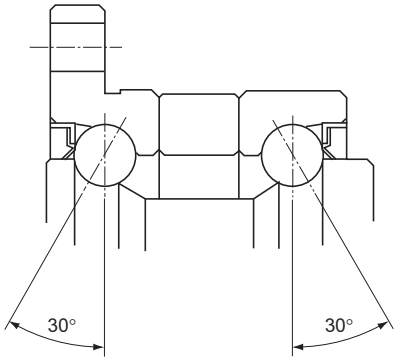
The spline nut is integrated with the support bearings, allowing highly accurate, compact design to be achieved.

Easy Installation

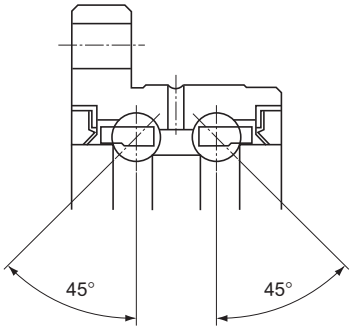
This ball spline can easily be installed by simply securing it to the housing using bolts.

High Rigidity

Since the contact angle is large and an appropriate preload is applied, high rigidity against torque and moment is achieved.
The support bearing has a contact angle of 30° to secure high rigidity against a moment load, thus achieving a rigid shaft support.
Model LTR-A, a compact type of LTR, has a contact angle of 45°.



Model LTR



Model LTR-A

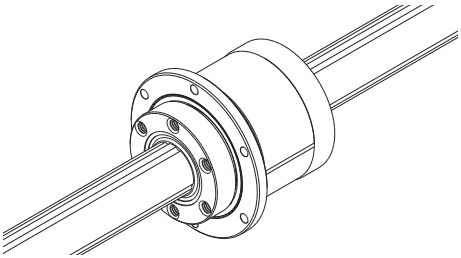
Types and Features

Types of Spline Nuts

Ball Spline Model LTR

Dimensional Table⇒A3-118

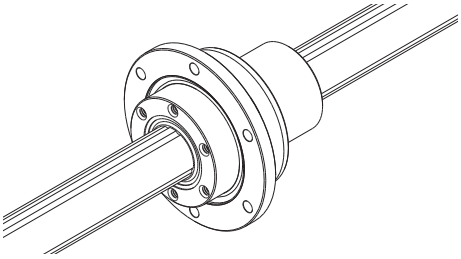
This model is a compact unit type whose support bearings are directly integrated with the outer surface of the spline nut.



Ball Spline Model LTR-A

Dimensional Table⇒A3-116

This model is a compact type even smaller than LTR.



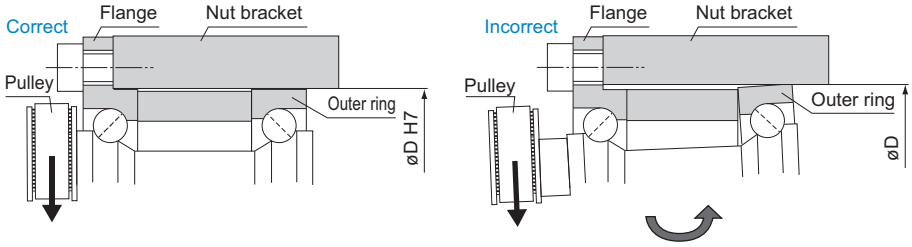
Types of Spline Shafts

For details, see A3-81.

Housing Inner-Diameter Tolerance

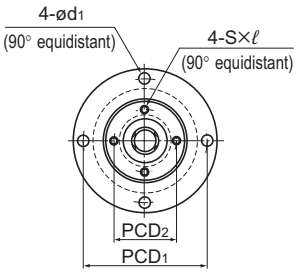
For the housing inner-diameter tolerance for model LTR, class H7 is recommended.

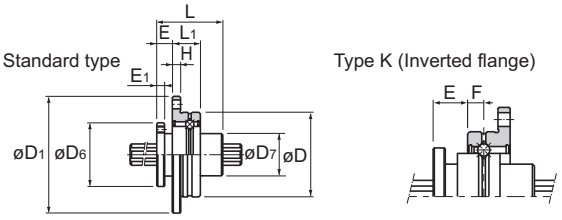
Important Note Concerning Model LTR



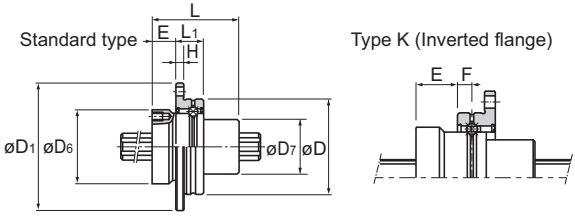
Note: Because of the divided outer ring, it is necessary to incorporate inner-diameter tolerance in the nut bracket (H7 is recommended) to prevent shifting of the outer ring on the side opposite the flange.

Model LTR-A Compact Type





Model LTR8A



Model LTR10A

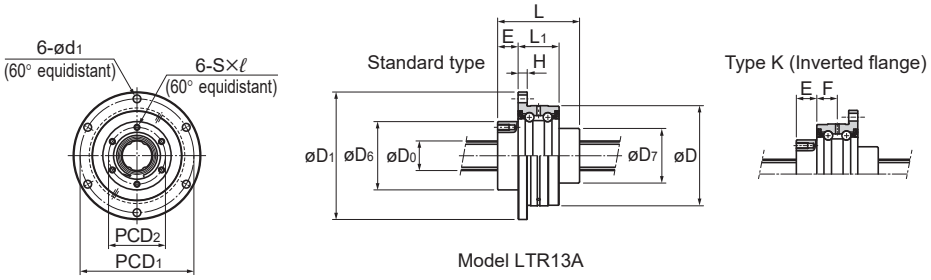
Model No.	Spline nut dimensions															
	Outer diameter		Length	Flange diameter					Standard type	Type K	Lubrication hole position					
	D	Tolerance	L	D_1	D_6 h7	D_7	H	L_1	E	E	F	E_1	PCD_1	PCD_2	S×ℓ
LTR8 A	32	–0.009 –0.025	25	44	24	16	3	10.5	6	8.5	4	3	38	19	M2.6×3
LTR10 A	36		33	48	28	21	3	10.5	9	11.5	4	—	42	23	M3×4
LTR13 A	44		36	56	30	24	4	18	9	9	9	—	50	25	M2.5×5
LTR16 A	48		50	64	36	31	6	21	10	10	10.5	—	56	30	M4×6
LTR20 A	56	–0.010 –0.029	63	72	43.5	35	6	21	12	12	10.5	—	64	36	M5×8
LTR25 A	66		71	86	52	42	7	25	13	13	12.5	—	75	44	M5×8
LTR32 A	78		80	103	63	52	8	25	17	17	12.5	—	89	54	M6×10
LTR40 A	100	–0.012 –0.034	100	130	79.5	64	10	33	20	20	16.5	—	113	68	M6×10

Model number coding

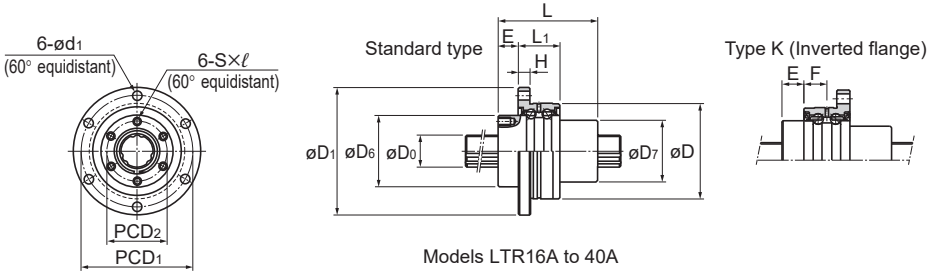
2 LTR32 K UU ZZ CL A +500L P K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LTR32: Model No.
- K: Flange orientation symbol [1]
- UU: Spline nut contamination protection accessory symbol [2]
- ZZ: Support bearings contamination protection accessory symbol [3]
- CL: Symbol for clearance in the rotational direction [4]
- A: Compact type (support bearing)
- +500L: Overall spline shaft length[7] (in mm)
- P: Accuracy symbol [5]
- K: Symbol for spline shaft[6]

[1] No Symbol: standard K: inverted flange [2] See A3-128. [3] See A3-128. [4] See A3-32. [5] See A3-37. [6] See A3-120. [7] See A3-123.



Model LTR13A



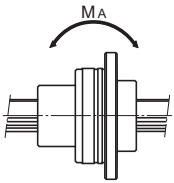
Models LTR16A to 40A

Unit: mm

	Spline shaft diameter		Basic torque rating		Basic load rating		Static permissible moment	Support bearing basic load rating		Mass	
d_1	D_0 h7	Rows of balls	C_T N·m	C_{0T} N·m	C kN	C_0 kN	M_A[1] N·m	C kN	C_0 kN	Spline nut kg	Spline shaft kg/m
3.4	8	4	1.96	2.94	1.47	2.55	5.9	0.69	0.24	0.08	0.4
3.4	10	4	3.92	7.84	2.84	4.9	15.7	0.77	0.3	0.13	0.62
3.4	13	4	5.88	10.8	3.53	5.78	19.6	5.2	5.1	0.22	1.1
4.5	16	6	31.4	34.3	7.06	12.6	67.6	6.7	6.4	0.35	1.6
4.5	20	6	56.9	55.9	10.2	17.8	118	7.4	7.8	0.51	2.5
5.5	25	6	105	103	15.2	25.8	210	9.7	10.6	0.79	3.9
6.6	32	6	180	157	20.5	34	290	10.5	12.5	1.25	5.6
9	40	6	419	377	37.8	60.5	687	16.5	20.7	2.51	9.9

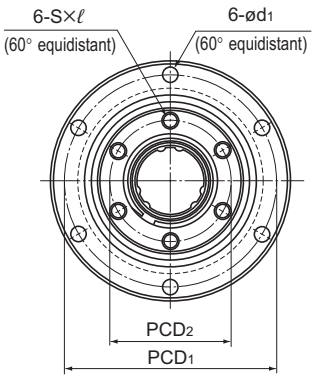
[1] M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure below.

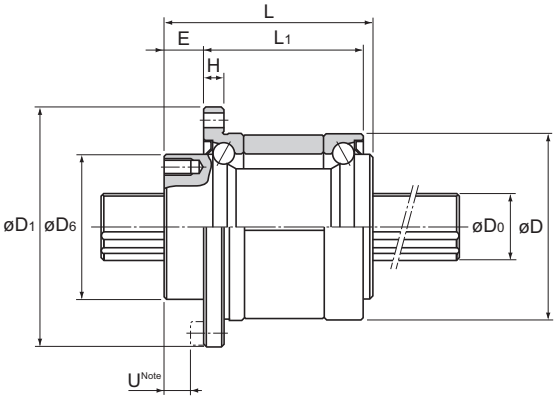
Note: For details on the maximum lengths of ball spline shafts by accuracy, please see A3-123.



Options⇒A3-128

Model LTR





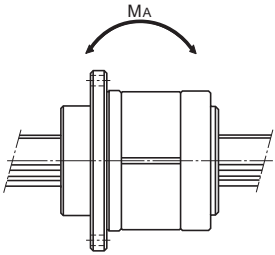
Model No.	Spline nut dimensions										
	Outer diameter		Length	Flange diameter							
	D	Tolerance	L	D_1	D_6 h7	H	L_1	E	PCD_1	PCD_2	S×ℓ
LTR 16	52	0 −0.007	50	68	39.5	5	37	10	60	32	M5×8
LTR 20	56		63	72	43.5	6	48	12	64	36	M5×8
LTR 25	62		71	78	53	6	55	13	70	45	M6×8
LTR 32	80		80	105	65.5	9	60	17	91	55	M6×10
LTR 40	100	0 −0.008	100	130	79.5	11	74	23	113	68	M6×10
LTR 50	120		125	156	99.5	12	97	25	136	85	M10×15
LTR 60	134	0 −0.009	140	170	115	12	112	25	150	100	M10×15

Model number coding

2 LTR50 K UU ZZ CM +1000L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LTR50: Model No.
- K: Flange orientation symbol [1]
- UU: Spline nut contamination protection accessory symbol [2]
- ZZ: Support bearings contamination protection accessory symbol [3]
- CM: Symbol for clearance in the rotational direction [4]
- +1000L: Overall spline shaft length [7] (in mm)
- H: Accuracy symbol [5]
- K: Symbol for spline shaft [6]

[1] No Symbol: standard K: flange inversed [2] See A3-128. [3] See A3-128. [4] See A3-32. [5] See A3-37. [6] See A3-120. [7] See A3-123.



Unit: mm

			Spline shaft diameter		Basic torque rating		Basic load rating		Static permissible moment	Support bearing basic load rating		Mass	
	d_1	U Note	D_0 h7	Rows of balls	C_T N·m	C_{0T} N·m	C kN	C_0 kN	M_A [1] N·m	C kN	C_0 kN	Spline nut kg	Spline shaft kg/m
	4.5	5	16	6	31.4	34.3	7.06	12.6	67.6	12.7	11.8	0.51	1.6
	4.5	7	20	6	56.9	55.9	10.2	17.8	118	16.3	15.5	0.7	2.5
	4.5	8	25	6	105	103	15.2	25.8	210	17.6	18	0.93	3.9
	6.6	10	32	6	180	157	20.5	34	290	20.1	24	1.8	5.6
	9	13	40	6	419	377	37.8	60.5	687	37.2	42.5	3.9	9.9
	11	13	50	6	842	769	60.9	94.5	1,340	41.7	54.1	6.7	15.5
	11	13	60	6	1,220	1,040	73.5	111.7	1,600	53.1	68.4	8.8	22.3

[1] M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.

Notes: Dimension U represents the dimension from the head of the hexagonal-socket-head type bolt to the spline nut end.
For details on the maximum lengths of ball spline shafts by accuracy, please see A3-123.

Options⇒A3-128

Spline Shaft

Spline shafts are divided by shape into precision solid spline shafts, special spline shafts, and hollow spline shafts (types K and N), as described on A3-81.
Spline shafts can be produced with various shapes according to customer requests. Please provide a drawing of the desired shaft shape when asking for an estimate or placing an order.

Cross-Sectional Shape of the Spline Shaft

Table 1 shows the cross-sectional shape of a spline shaft. When the spline shaft ends need to be cylindrical, if possible, the width should not exceed the minor diameter (ød) value of the shaft.

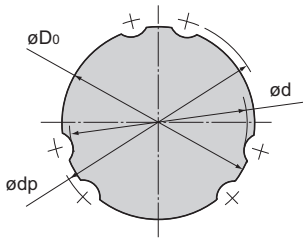


Table 1: Cross-Sectional Shape of the Spline Shaft

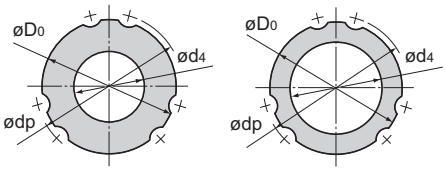
Unit: mm

Nominal shaft diameter	8	10	13	16	20	25	32	40	50	60
Minor diameter ød	7	8.5	11.5	14.5	18.5	23	30	37.5	46.5	56.5
Major diameter øD0 h7	8	10	13	16	20	25	32	40	50	60
Ball center-to-center diameter ødp	9.3	11.5	14.8	17.8	22.1	27.6	35.2	44.2	55.2	66.3
Mass (kg/m)	0.4	0.62	1.1	1.6	2.5	3.9	5.6	9.9	15.5	22.3

Note: The minor diameter ød must be a value at which no groove is left after machining.

Hole Shape of the Standard Hollow Type Spline Shaft

Table 2 shows the hole shapes of the standard hollow spline shafts (types K and N).
Use this table when a requirement such as piping, wiring, air ventilation, or weight reduction needs to be met.



Type K (Thick)

Type N (Thin)

Table 2: Cross-Sectional Shape of the Standard Hollow Spline Shaft

Unit: mm

Nominal shaft diameter		8	10	13	16	20	25	32	40	50	60
Major diameter øD0 h7		8	10	13	16	20	25	32	40	50	60
Ball center-to-center diameter ødp		9.3	11.5	14.8	17.8	22.1	27.6	35.2	44.2	55.2	66.3
Type K	Hole diameter ød4	3	4	5	7	10	12	18	22	25	32
	Mass (kg/m)	0.35	0.52	0.95	1.3	1.8	3	4.3	6.9	11.6	16
Type N	Hole diameter ød4	—	—	—	11	14	18	23	29	36	—
	Mass (kg/m)	—	—	—	0.8	1.3	1.9	3.1	4.7	7.4	—

Note: The standard hollow spline shaft is divided into types K and N. Indicate “K” or “N” at the end of the model number to distinguish between them when placing an order.

Chamfering of the Spline Shaft Ends

To facilitate the insertion of the spline shaft into a spline nut, the shaft ends are normally chamfered with the dimensions indicated below unless otherwise specified.
The ends are chamfered whether they are used, such as with stepped, tapped, or drilled ends, or not used, such as with cantilevered supports.

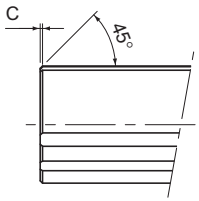


Table 3: Chamfer Dimensions of Model LTR-A and Model LTR Spline Shaft Ends

Unit: mm

Nominal shaft diameter	8	10	13	16	20	25	32	40	50	60
Chamfer C	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	2

Length of the Incompletely Ground Area of a Special Spline Shaft

If any part of the spline shaft is thicker than the minor diameter (ød), incompletely ground spline grooves with rounded inside corners will be left by the grinding process. The relationship between the flange diameter (ødf) and the length of incomplete splines (S) is shown in Table 4.
(This table does not apply to overall lengths of 1,500 mm or greater. Contact THK for details.)

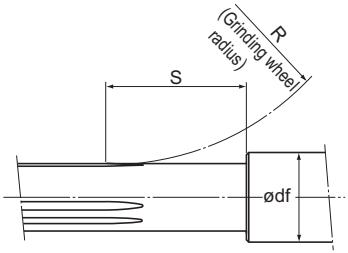


Table 4: Length of Incomplete Spline Area: S

Unit: mm

Flange diameter ødf / Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100	120	140	160
8	—	25	29	35	41	—	—	—	—	—	—	—	—	—	—	—
10	—	—	26	31	38	45	—	—	—	—	—	—	—	—	—	—
13	—	—	—	33	39	46	56	—	—	—	—	—	—	—	—	—
16	—	—	—	—	36	47	58	67	—	—	—	—	—	—	—	—
20	—	—	—	—	—	37	50	60	76	—	—	—	—	—	—	—
25	—	—	—	—	—	—	38	51	72	88	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	40	75	88	109	—	—	—	—
40	—	—	—	—	—	—	—	—	42	63	81	107	—	—	—	—
50	—	—	—	—	—	—	—	—	—	45	65	96	118	—	—	—
60	—	—	—	—	—	—	—	—	—	—	50	87	114	134	—	—

Permissible Rotational Speed for Rotary Ball Splines

For Model LTR rotary ball splines, the speed is restricted by whichever is lower of the support bearing permissible rotational speed and the critical speed of the spline. When using the product, do not exceed the permissible rotational speed.

Table 5: Model LTR Permissible Rotational Speed

Unit: min^{-1}

Model No.	Permissible rotational speed		
	Ball spline	Support bearing	
	Calculated using shaft length	Grease lubrication	Oil lubrication
LTR16	See A3-16.	4,000	5,400
LTR20		3,200	4,300
LTR25		2,800	3,700
LTR32		2,400	3,300
LTR40		2,000	2,700
LTR50		1,600	2,200
LTR60		1,400	2,000

Table 6: Model LTR-A Permissible Rotational Speed

Unit: min^{-1}

Model No.	Permissible rotational speed		
	Ball spline	Support bearing	
	Calculated using shaft length	Grease lubrication	Oil lubrication
LTR8A	See A3-16.	6,900	9,300
LTR10A		5,900	7,900
LTR13A		4,500	6,200
LTR16A		4,000	5,400
LTR20A		3,500	4,700
LTR25A		2,900	3,900
LTR32A		2,400	3,300
LTR40A		1,900	2,600

Maximum Manufacturing Lengths by Accuracy

Table 1, Table 2, Table 3, and Table 4 show the maximum manufacturing lengths of ball spline shafts by accuracy.

Table 1: Maximum Manufacturing Lengths of Models SLS, SLS-L, and SLF

Unit: mm

Nominal shaft diameter	Accuracy		
	Normal grade (no symbol)	High Accuracy grade (H)	Precision grade (P)
25	2,000	1,500	1,000
30	2,000	1,600	1,250
40	2,000	2,000	1,500
50	3,000	2,000	1,500
60	4,000	2,000	2,000
70	4,000	2,000	2,000
80	4,000	2,000	2,000
100	4,000	3,000	3,000

Table 2: Maximum Manufacturing Lengths of Models LBS, LBST, LBF, LBR, LBH, LBG, and LBGT by Accuracy

Unit: mm

Nominal shaft diameter	Accuracy		
	Normal grade (no symbol)	High Accuracy grade (H)	Precision grade (P)
15	1,800	600	600
20	1,800	700	700
25	3,000	1,400	1,400
30	3,000	1,400	1,400
40	3,000	1,400	1,400
50	3,000	1,400	1,400
60	3,800	2,500	2,000
70	3,800	2,500	2,000
85	3,800	3,000	3,000
100	4,000	3,000	3,000
120	3,000	3,000	3,000
150	3,000	3,000	3,000

Table 3: Maximum Manufacturing Lengths of Models LT-X, LF-X, LFK-X, and LFH-X by Accuracy Unit: mm

Nominal shaft diameter	Accuracy		
	Normal grade (no symbol)	High Accuracy grade (H)	Precision grade (P)
4	200	200	200
5	250	200	200
6	315	250	200
8	500	400	315
10	1,000	630	500
13	1,000	800	630
16	2,000	1,000	1,000
20	2,000	1,500	1,000
25	3,000	1,500	1,000
30	3,000	1,600	1,250

Table 4: Maximum Manufacturing Lengths of Models LT, LF, LTR, and LTR-A by Accuracy Unit: mm

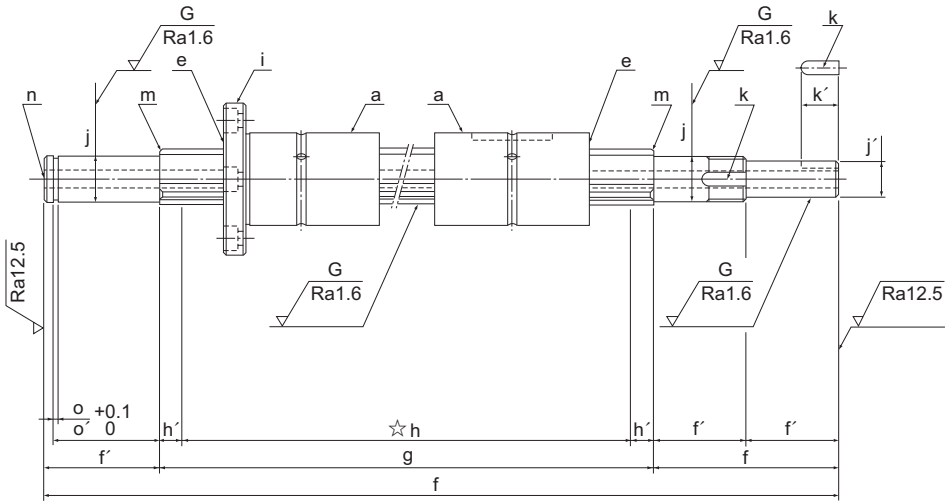
Nominal shaft diameter	Accuracy		
	Normal grade (no symbol)	High Accuracy grade (H)	Precision grade (P)
4	600	200	200
5	600	315	200
6	600	400	315
8	1,000	500	400
10	1,000	630	500
13	1,000	800	630
16	2,000	1,000	1,000
20	2,000	1,500	1,000
25	3,000	1,500	1,000
30	3,000	1,600	1,250
32	3,000	1,600	1,250
40	3,000	2,000	1,520
50	3,000	2,000	1,500
60	4,000	2,000	2,000
80	4,000	2,000	2,000
100	4,000	3,000	3,000

Notes: The length in the table represents the overall shaft length.
With standard hollow shaft type (K), the values in the table apply.
With standard hollow shaft type (N), the available maximum length for both the Normal grade and the High Accuracy grade is up to the length defined for the precision grade in the table.

Checklist for Spline Shaft End Shape

If desiring a ball spline type with its end specially machined, check the following items when placing an order.

The diagram below shows a basic configuration of the ball spline.



Check Items

a. Type of spline nut to be fit
b. Number of spline nuts
c. Clearance in the rotational direction
d. Accuracy
e. With/without a seal (for a single seal, check its orientation)
f. Overall length (Are all dimensions included? Is the total value correct?)
g. Effective spline length
h. Heat treated area (mark the location with symbol ☆ and indicate the purpose of heat treatment)
i. Orientation of the flange (for flanged type)
j. Spline shaft end shape (thicker than the minimum spline diameter?) (black, mill scale)
k. Positional relationship between the spline nut and the spline shaft end shape (keyway of the spline nut, flange mounting hole)
l. Indication of chamfering for each part
m. Shape of chamfer on the spline shaft end (see **A3-72**)
n. Intended purpose of the through hole in the spline shaft if any
o. o'. Snap ring groove
p. Maximum length
q. With precedent or not

Housing Inner-Diameter Tolerance

When fitting the spline nut to the housing, tight fitting is normally recommended. If the accuracy of the ball spline does not need to be very high, clearance fitting is also acceptable.

Table 1: Housing Inner-Diameter Tolerance

Housing inner-diameter tolerance	General conditions	H7
	When clearance needs to be small	J6

Note: For the housing inner-diameter tolerance of Rotary Ball Spline Model LTR, H7 is recommended.

Positions of the Spline-Nut Keyway and Mounting Holes

The keyways formed on the outer surface of straight nuts for ball spline models are positioned where balls under a load are placed as shown in Fig. 1.
The flange-mounting holes of the flange types are positioned as shown in Fig. 2.
When placing an order, indicate their positions in relation to the keyway or the like to be formed on the spline shaft.

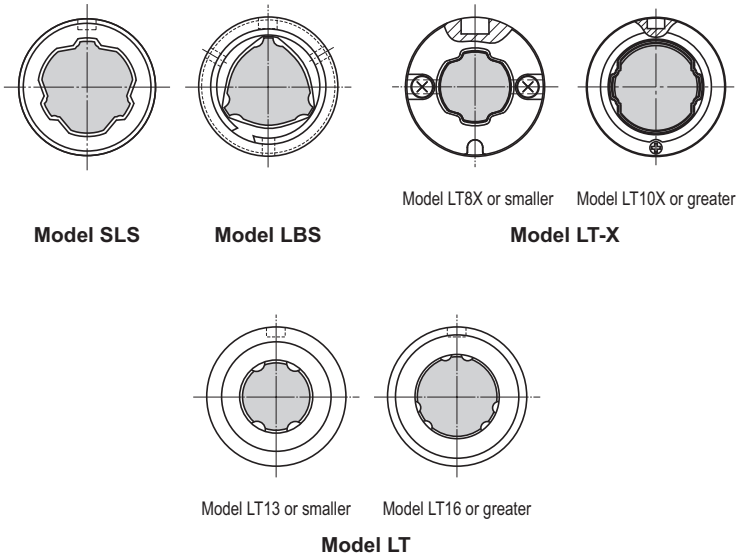
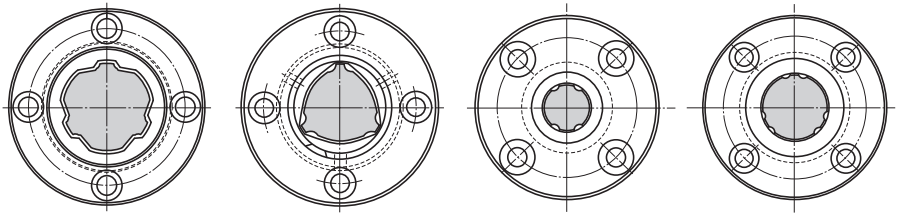
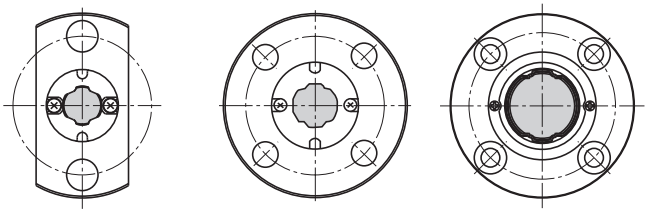


Fig. 1: Positions of Keyways



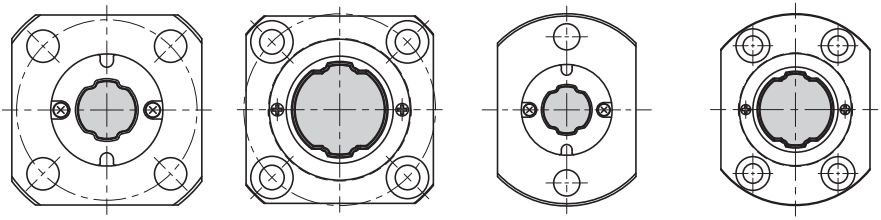
Model LF13 or smaller | Model LF16 or greater

Model SLF | **Model LBF** | **Model LF**



Model LF4X | Models LF5X to 8X | Model LF10X or greater

Model LF-X



Model LFK8X or smaller | Model LFK10X or greater | Model LFH13X or smaller | Model LFH16X or greater

Model LFK-X | **Model LFH-X**

Fig. 2: Positions of Flange Mounting Holes

Material and Surface Treatment

Depending on the service environment, the ball spline requires anticorrosive treatment or a different material. For details on anticorrosive treatment and material options, contact THK.

Contamination Protection

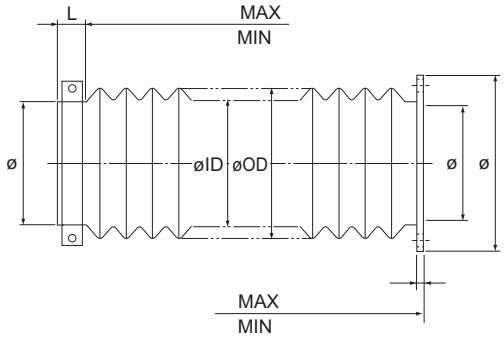
Entrance of dust or other foreign material into the spline nut will cause abnormal wear or shorten the service life. Therefore, it is necessary to prevent detrimental foreign material from entering the ball spline. When entrance of dust or other foreign material is a possibility, it is important to select effective seals and/or contamination protection devices suited to the environmental conditions.
For the ball spline, a special synthetic rubber seal that is highly resistant to wear is available as a contamination protection accessory. If desiring stronger contamination protection, a felt seal is also available for some types. For details about the felt seal, contact THK.
In addition, THK produces round bellows. Contact us for details.

Table 1: Contamination Protection Accessory Symbol

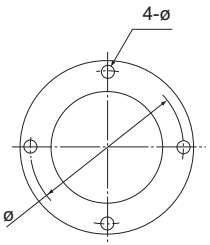
Symbol	Contamination protection accessory
No symbol	Without seal
UU	Rubber seal attached on both ends of spline nut
U	Rubber seal attached on either end of spline nut
DD	Felt seal attached on both ends of spline nut
D	Felt seal attached on either end of spline nut
ZZ	Rubber seal attached on both ends of support bearings
Z	Rubber seal attached on either end of support bearings

Specifications of the Bellows

Bellows are available as a contamination protection accessory. Use this specification sheet.



(Band type)



(Flange type)

Specifications of the Bellows

Ball spline model number:

Dimensions of the bellows

Stroke: ( ) mm MAX: ( ) mm MIN: ( ) mm
Permissible outer diameter: (øOD) Desired inner diameter: (øID)

How it is used

Installation direction: (horizontal, vertical, slanted) Speed: ( ) m/s or m/min
Motion: (reciprocation, vibration)

Conditions

Resistance to oil and water: (necessary, unnecessary) Oil name ( )
Chemical resistance: Name ( ) × ( ) %
Location: (indoor, outdoor)

Remarks:

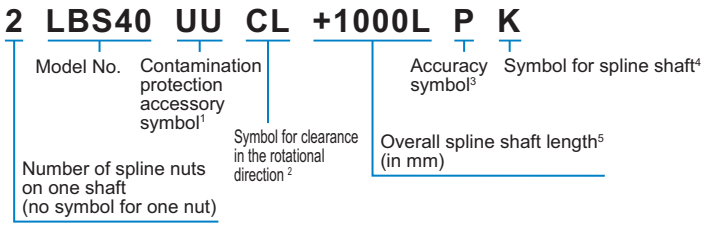
Number of units to be manufactured:

Model Number Coding

Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

Ball Spline

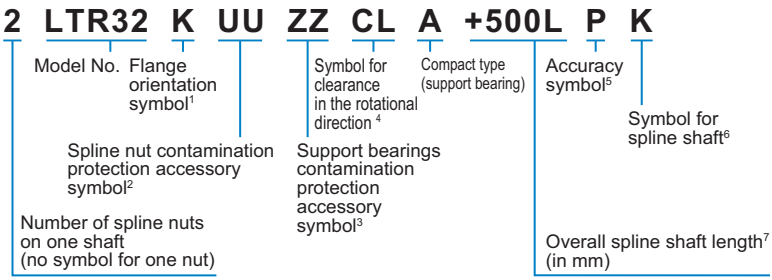
- **Models SLS, SLS-L, SLF, LBS, LBST, LBF, LBR, LBH, LT, LF, LT-X, LF-X, LFK-X, and LFH-X**



[1] See A3-128. [2] See A3-32. [3] See A3-37. [4] See A3-71. [5] See A3-123.

Rotary Ball Spline

- **Models LTR, LTR-A, LBG, and LBGT**



[1] No Symbol: standard K: flange inversed [2] See A3-128. [3] See A3-128. [4] See A3-32. [5] See A3-37. [6] See A3-120. [7] See A3-123.

Handling

(1) Please use at least two people to move any product weighing 20 kg or more, or use a cart or another method of conveyance. Otherwise, it may cause injury or damage the unit.
(2) Do not disassemble the parts. This may result in loss of functionality.
(3) Tilting a spline nut or spline shaft may cause them to fall by their own weight.
(4) Take care not to drop or strike the ball spline. Otherwise, it may cause injury or damage the unit. Even if there is no outward indication of damage, a sudden impact could prevent the unit from functioning properly.
(5) When mounting the product, do not remove the spline nut from the spline shaft.
(6) Wear appropriate safety gear, such as protective gloves and safety shoes, when handling the product.

Use

(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If the product is used in an environment where cutting chips, coolant, corrosive solvents, water, etc., may enter the product, use bellows, covers, etc., to prevent them from entering the product.
(3) Do not use the product at temperatures of 80℃ or higher. Unless the unit is specially designed to be heat-resistant, exposure to such temperatures may deform or damage plastic and rubber parts.
(4) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(5) Very small strokes can inhibit the formation of an oil film between the raceways and the areas of contact on the rolling elements, resulting in fretting. Therefore, be sure to use a type of grease with high fretting resistance properties if the stroke will be small. We recommend periodically allowing the nut to stroke a distance roughly equal to its length to help ensure that a film forms between the raceways and rolling elements.
(6) Do not forcibly drive a pin, key, or other positioning device into the product. This could create indentations on the raceway and impair the product's function.
(7) Skewing or misalignment of the spline shaft support and spline nut can shorten service life substantially. Inspect the components carefully and make sure they are mounted correctly.
(8) The spline nut must contain all its internal rolling elements (balls) when mounted on the spline shaft. Using a spline nut with any balls removed may result in premature damage.
(9) If any rolling elements fall out, contact THK. Do not use the product in that condition.
(10) To mount the spline nut on the spline shaft, first locate the alignment indicators on both components, then insert the shaft through the opening in the spline nut, without forcing it, and adjust the position until the indicators are aligned. Forcing the shaft could cause balls to fall out. When mounting a spline nut equipped with a seal or preload, first lubricate the outer surface of the spline shaft.
(11) Manipulate the spline nut gently, using a jig, when inserting it into the housing, taking care not to strike the side plate, end cap, or seal.
(12) If the mounting material lacks sufficient rigidity or accuracy, the bearing load may be focused in one area, and bearing functionality will dramatically decrease. Therefore, carefully consider the rigidity and accuracy of the housing and base, and the strength of the securing bolts.
(13) If you want to have a flanged-type ball spline undergo additional machining, such as adding a dowel pin hole, contact THK.

Lubrication

(1) Thoroughly remove anti-rust oil and apply lubricant before using the product.
(2) Do not mix different lubricants. Even greases containing the same type of thickening agent may, if mixed, interact negatively due to disparate additives or other ingredients.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuums, and extreme heat or cold, use a lubricant suitable for its use/environment.
(4) When lubricating a product having no grease nipple or lubrication hole, apply grease directly on the raceway and stroke the product several times to let the grease spread inside.
(5) The consistency of grease changes according to the temperature. Take note that the slide resistance of the ball spline may be affected by changes in viscosity.
(6) After lubrication, the slide resistance of the ball spline may increase due to the stirring resistance of the grease. Be sure to perform a warm-up operation and allow the grease to break in sufficiently before operating the machine.
(7) Excess grease may spatter after lubrication. Wipe off spattered grease as necessary.
(8) Grease deteriorates over time, which decreases the lubricity, so perform regular grease inspections and replenish grease based on frequency of use.
(9) Although the lubrication interval may vary according to operating conditions and the service environment, lubrication should be performed approximately every 100 km in travel distance (three to six months). The final lubrication interval/amount should be set at the actual machine.
(10) When using oil lubrication, the lubricant may not be distributed throughout the ball spline due to its mounting orientation. Contact THK in advance for details.

Storage

When storing the ball spline, pack it as designated by THK and store it indoors in a horizontal position away from high or low temperatures and high humidity.
Please note that if the product has been kept in storage for an extended period, the lubricant inside may have deteriorated. Please ensure that you replenish the lubricant before use.
If you request that we do not apply anti-rust oil to a product, please be aware that it may rust due to the storage environment or length of storage.

Disposal

The product should be treated as industrial waste and disposed of appropriately.