

High Torque Type Ball Spline

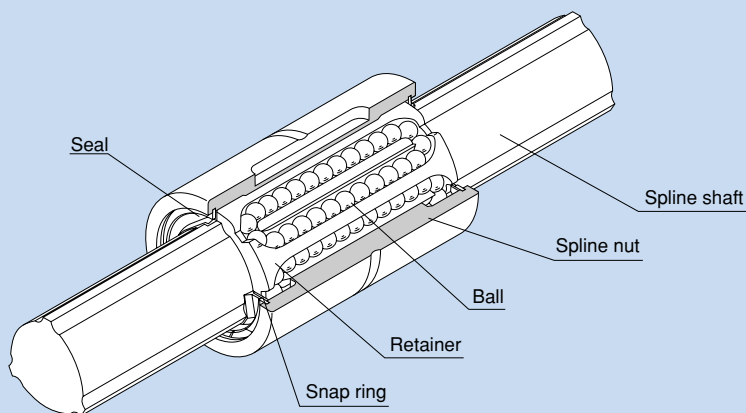


Fig. 1 Structure of High Torque Type Ball Spline Model LBS

● Structure and Features

With the high torque type Ball Spline, the spline shaft has three crests positioned equidistantly at 120°, and along both sides of each crest, two rows of balls (six rows in total) are arranged so as to hold the crest, as shown in Fig. 1.

The raceways are precision ground into R-shaped grooves whose diameters are approximate to the ball diameter. When a torque is generated from the spline shaft or the spline nut, the three rows of balls on the load-bearing side evenly receive the torque, and the center of rotation is automatically determined. When the rotation reverses, the remaining three rows of balls on the unloaded side receive the torque.

The rows of balls are held in a retainer incorporated in the spline nut so that they smoothly roll and circulate. With this design, balls will not fall even if the spline shaft is removed from the nut.

● No Angular Backlash

With the high torque type Ball Spline, a single spline nut provides a preload to eliminate angular backlash and increase the rigidity.

Unlike conventional ball splines with circular-arc groove or Gothic-arch groove, the high torque type Ball Spline eliminates the need for twisting two spline nuts to provide a preload, thus allowing compact design to be achieved easily.

● High Rigidity and Accurate Positioning

Since this model has a large contact angle and provides a preload from a single spline nut, the initial displacement is minimal and high rigidity and high positioning accuracy are achieved.

● High-speed motion, high-speed rotation

Adoption of a structure with high grease retention and a rigid retainer enables the ball spline to operate over a long period with grease lubrication even in high-speed linear motion. Since the distance in the radius direction is almost uniform between the loaded balls and the unloaded balls, the balls are little affected by the centrifugal force and smooth linear motion is achieved even during high-speed rotation.

● Compact design

Unlike conventional ball splines, unloaded balls do not circulate on the outer surface of the spline nut with this model. As a result, the outer diameter of the spline nut is reduced and a space-saving and compact design is achieved.

● Easy installation

When installing this model with blind holes or in complex structures, balls will not fall off even if the spline nut is removed from the spline shaft. Thus, it is easy to mount, maintain and inspect this model.

● Can be used as a linear bush for heavy loads

Since the ball raceways are machined into R grooves whose diameter is almost equal to the ball diameter, the contact area of the ball is large and the load capacity is large also in the radial direction.

● Double, parallel shafts can be replaced with a single shaft

Since a single shaft is capable of receiving a load in the torque direction and the radial direction, double shafts in parallel configuration can be replaced with a single-shaft configuration. This allows easy installation and achieves space-saving design.

● Applications

The high torque type Ball Spline is a reliable linear motion system used in a wide array of applications such as the columns and arms of industrial robot, automatic loader, transfer machine, automatic conveyance system, tire forming machine, spindle of spot welding machine, guide shaft of high-speed automatic coating machine, riveting machine, wire winder, work head of electric discharge machine, spindle drive shaft of grinding machine, speed gears and precision indexing shaft.

● Types and Features

● Types of Spline Nuts

Cylindrical Type Ball Spline Model LBS (Medium Load Type)



The most compact type with a straight cylindrical spline nut. When transmitting a torque, a key is driven into the body. The outer surface of the spline nut is provided with anti-carbonation treatment.

Cylindrical Type Ball Spline Model LBST (Heavy Load Type)



A heavy load type that has the same spline nut diameter as model LBS, but has a longer spline nut length. It is optimal for locations where the space is small, a large torque is applied, and an overhang load or moment load is applied.

Flanged Type Ball Spline Model LBF



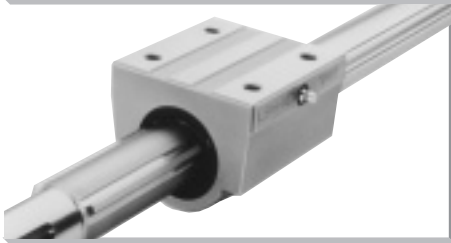
The spline nut can be attached to the housing via the flange, making assembly simple. It is optimal for locations where the housing may be deformed if a keyway is machined on its surface, and where the housing width is small. Since it allows a knock pin to be driven into the flange, angular backlash occurring in the fitting can completely be eliminated.

Flanged Type Ball Spline Model LBR



Based on the heavy load type model LBST, this model has a flange in the central area, making itself optimal for locations under a moment load such as arms of industrial robots.

Square Type Ball Spline Model LBH



Its rigid square spline nut does not require a housing and can be directly mounted on the machine body. Thus, a compact, highly rigid linear guide system is achieved.

●Types of Spline Shafts

Precision Solid Spline Shaft (Standard Type)



The spline shaft is cold-drawn and its raceway is precision ground. It is used in combination with a spline nut.

Special Spine Shaft



THK manufactures a spline shaft with thicker ends or thicker middle area through special processing at your request.

Hollow Spline Shaft (Type K)



A drawn, hollow spline shaft is available for requirements such as piping, wiring, air-vent and weight reduction.

Housing Inner-diameter Tolerance

When fitting the spline nut with 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 service conditions	H7
	When clearance needs to be small	J6

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (type K), as described on page b-21.

Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when asking an estimate or placing an order.

Sectional Shape of the Spline Shaft

Table 2 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (d) value should not be exceeded if possible.

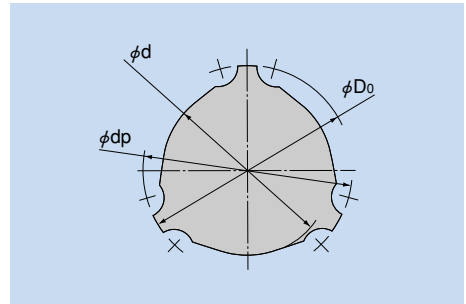


Table 2 Sectional Shape of the Spline Shaft

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
Minor diameter d	11.7	15.3	19.5	22.5	31	39	46.5	54.5	67	81	101	130
Major diameter D ₀	14.5	19.7	24.5	29.6	39.8	49.5	60	70	84	99	117	147
Ball center diameter dp	15	20	25	30	40	50	60	70	85	100	120	150
Mass (kg/m)	1	1.8	2.7	3.8	6.8	10.6	15.6	21.3	32	45	69.5	116.6

● Hole Shape of the Standard Hollow Type Spline Shaft

Table 3 shows the hole shape of the standard hollow type spline shaft. Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.

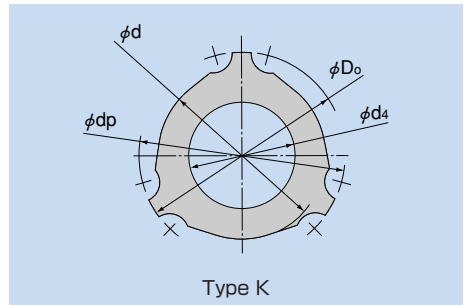


Table 3 Sectional Shape of the Standard Hollow Type Spline Shaft

Unit: mm

Nominal shaft diameter	20	25	30	40	50	60	70	85	100	120	150
Minor diameter d	15.3	19.5	22.5	31	39	46.5	54.5	67	81	101	130
Major diameter D _o	19.7	24.5	29.6	39.8	49.5	60	70	84	99	117	147
Ball center diameter dp	20	25	30	40	50	60	70	85	100	120	150
Hole diameter d ₄	6	8	12	18	24	30	35	45	56	60	80
Mass (kg/m)	1.6	2.3	2.9	4.9	7	10	13.7	19.5	25.7	47.3	77.1

● 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 dimensions as indicated below unless otherwise specified.

■ Chamfer A

If the spline shaft ends are stepped, tapped or drilled for specific use, they are machined with chamfer A dimensions indicated in table 4.

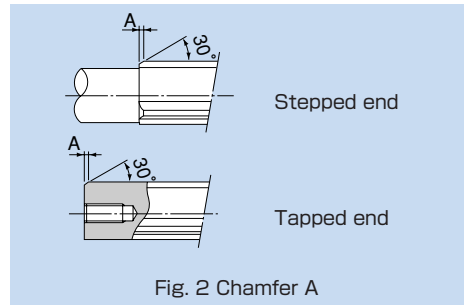


Fig. 2 Chamfer A

■ Chamfer B

If either end of the spline shaft is not used, such as cantilever support, it is machined with chamfer B dimensions indicated in table 4.

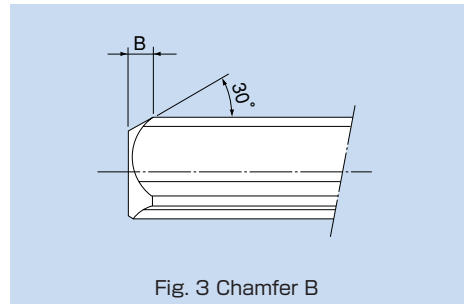


Fig. 3 Chamfer B

Table 4 Chamfer Dimensions of Spline Shaft Ends

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
Chamfer A	1	1	1.5	2.5	3	3.5	5	6.5	7	7	7.5	8
Chamfer B	3.5	4.5	5.5	7	8.5	10	13	15	16	17	17	18

Note: Spline shafts with nominal diameters 6, 8 and 10 are chamfered to C0.5.

● Length of Incomplete Section of a Special Spline Shaft

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (d), an incomplete spline section is required to secure a recess for grinding. Table 5 shows the relationship between the length of the incomplete section (S) and the flange diameter (d_f). (This table does not apply to overall length of 1500 mm or greater. Contact THK for details.)

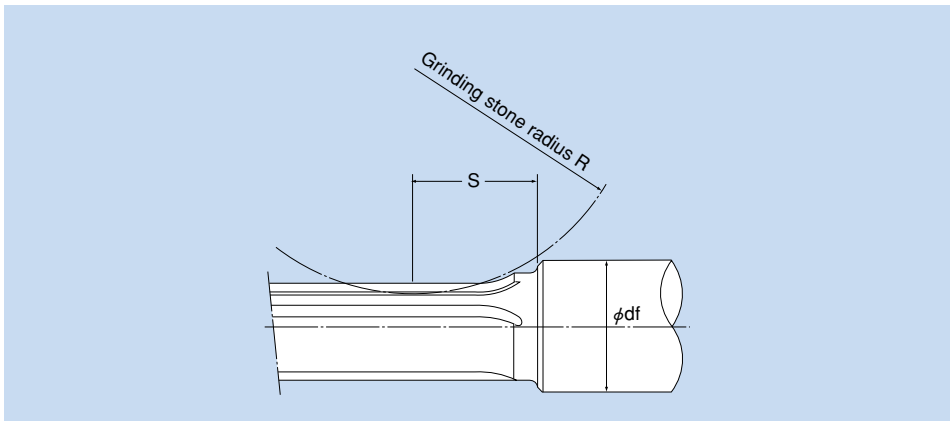


Table 5 Length of Incomplete Spline Section: S

Unit: mm

Flange diameter d_f Nominal shaft diameter	15	20	25	30	35	40	50	60	80	100	120	140	160	180	200
15	23	35	42	47	52	—	—	—	—	—	—	—	—	—	—
20	—	25	36	43	48	53	—	—	—	—	—	—	—	—	—
25	—	—	32	46	55	62	73	—	—	—	—	—	—	—	—
30	—	—	—	35	48	56	69	78	—	—	—	—	—	—	—
40	—	—	—	—	—	38	59	71	88	—	—	—	—	—	—
50	—	—	—	—	—	—	42	61	82	96	—	—	—	—	—
60	—	—	—	—	—	—	—	45	74	91	102	—	—	—	—
70	—	—	—	—	—	—	—	—	64	85	98	108	—	—	—
85	—	—	—	—	—	—	—	—	34	72	90	102	—	—	—
100	—	—	—	—	—	—	—	—	—	70	110	134	153	—	—
120	—	—	—	—	—	—	—	—	—	—	72	112	137	155	—
150	—	—	—	—	—	—	—	—	—	—	—	42	103	133	153

Accessory

Ball Spline models LBS and LBST are provided with a standard key as indicated in table 6.

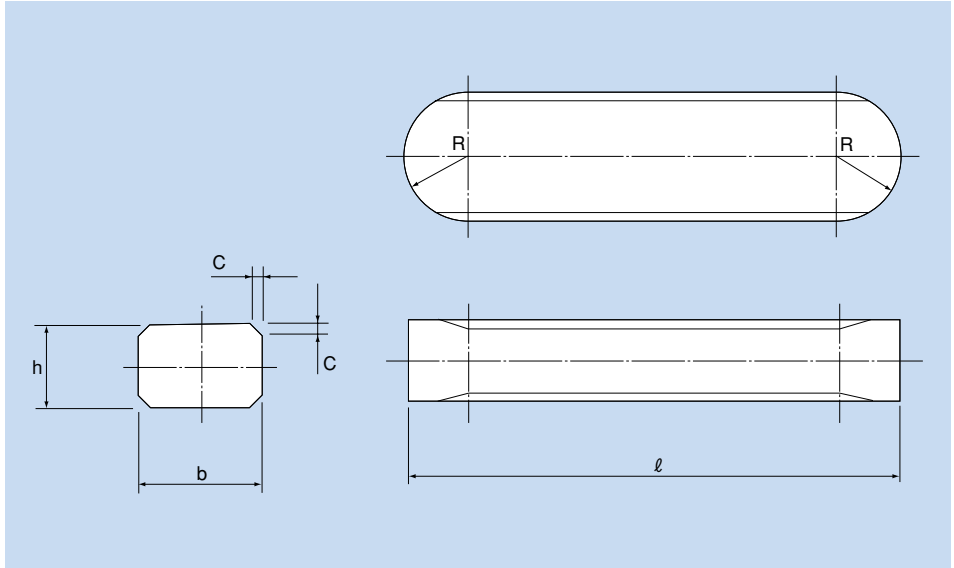


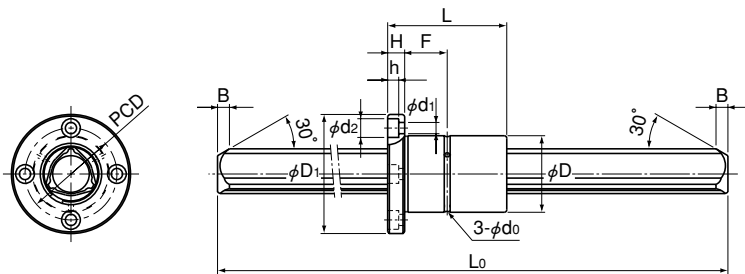
Table 6 Standard Keys for Models LBS and LBST

Unit: mm

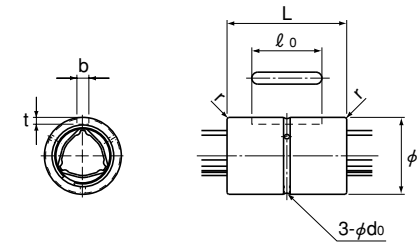
Nominal shaft diameter	Width b		Height h		Length ℓ		R	C
		Tolerance (p7)		Tolerance (h9)		Tolerance (h12)		
LBS 6	2		1.3		10	0 -0.150	1	0.3
LBS 8	2.5	+0.016 +0.006	2	0 -0.025	12.5	0 -0.180	1.25	
LBS 10	3		2.5		17		1.5	
LBS 15	3.5		3.5		20	0 -0.210	1.75	0.5
LBS 20 LBST 20	4	+0.024 +0.012	4	0 -0.030	26		2	
LBS 25 LBST 25	5		5		33	0 -0.250	2.5	
LBS 30 LBST 30	7	+0.030 +0.015	7		41		3.5	0.8
LBS 40 LBST 40	10		8	0 -0.036	55		5	
LBS 50 LBST 50	15		10		60	0 -0.300	7.5	
LBS 60 LBST 60	18	+0.036 +0.018	12		68		9	1.2
LBS 70 LBST 70				0 -0.043	80		10	
LBS 85 LBST 85	20		13		93	0 -0.350	14	
LBS 100 LBST 100	28	+0.043 +0.022	18		123		14	2
LBST 120	28		18		157	0 -0.400	16	
LBST 150	32	+0.051 +0.026	20	0 -0.052				

Standard Off-the-shelf Ball Spline Models LBS / LBF

Full spline



Model LBF



Model LBS

Unit: mm

Model No.	Outer diameter		Length		Flange diameter		Spline nut dimensions				Keyway dimensions			Greasing hole d_o	r	Spline shaft dimensions		Basic torque rating		Basic load rating (radial)	
	D	Tolerance	L	Tolerance	D_1	Tolerance	H	F	PCD	Mounting hole $d_1 \times d_2 \times h$	$\frac{b}{H8}$	$\frac{t}{+0.05/0}$	l_o			Length* L_o	Chamfer B	C_r^* N·m	C_{0T}^* N·m	C^* kN	C_o^* kN
LBS 15	23	0	40	0	—	—	—	—	—	—	3.5	2	20	2	0.5	1600	3.5	30.4	74.5	4.4	8.4
LBF 15		-0.013																			
LBS 20	30	—	50	-0.2	—	—	—	—	—	—	4	2.5	26	2	0.5	1800	4.5	74.5	160	7.8	14.9
LBF 20																					
LBS 25	37	0	60	—	0	—	—	—	—	—	5	3	33	3	0.5	2500	5.5	154	307	13	23.5
LBF 25																					
LBS 30	45	—	70	0	—	—	—	—	—	—	7	4	41	3	1	2500	7	273	538	19.3	33.8
LBF 30																					
LBS 40	60	—	90	-0.3	—	—	—	—	—	—	10	4.5	55	3	1	2500	8.5	599	1140	31.9	53.4
LBF 40																					
LBS 50	75	-0.019	100	—	0	—	—	—	—	—	15	5	60	4	1.5	3000	10	1100	1940	46.6	73
LBF 50																					

These standard off-the-shelf models are shipped in short delivery time. You can also specify the number of spline nuts.

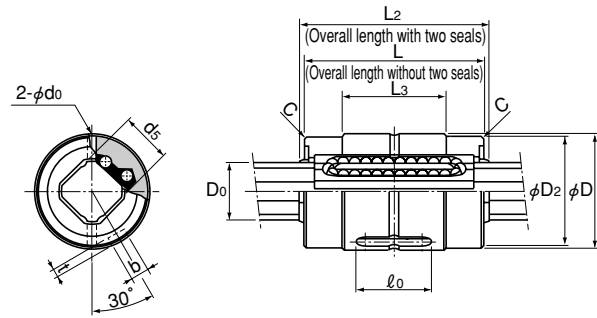
***Note** The values for the basic torque rating and basic load rating apply to single-nut configurations. The clearance in the rotational direction is assumed to be normal clearance, and the accuracy to be normal grade. If a greater length than the standard length is required, contact

Model number coding

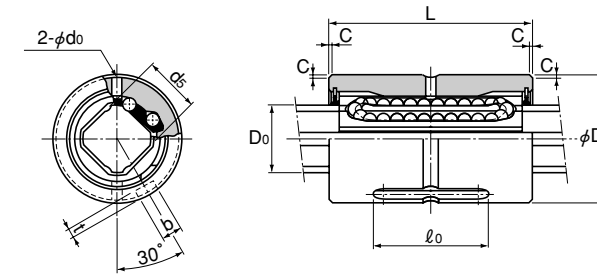
4 LBS20 UU +1800L



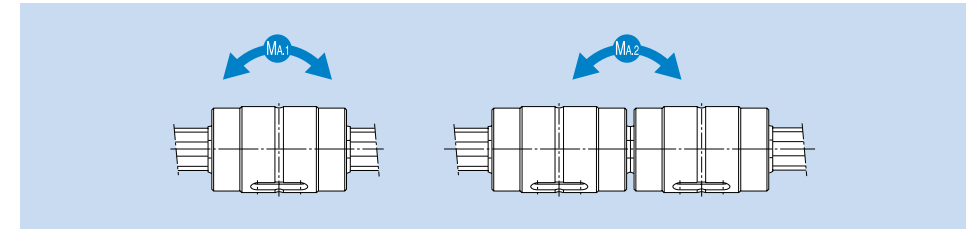
- 1 Number of spline nuts on one shaft (no symbol for one nut)
- 2 Model No.
- 3 Dust prevention accessory symbol - UU: rubber seal attached on both ends of spline nut
- 4 Overall spline shaft length (in mm)



Models LBS6 and 8



Model LBS10



Unit: mm

Model No.	Outer diameter		Length		Spline nut dimensions						Greasing hole d ₀	Spline shaft outer diameter		Basic torque rating		Basic load rating (radial)		Permissible static moment		Mass		
	D	Tolerance	L	Tolerance	L ₂	L ₃	D ₂	^b / _{HB}	^t / _{+0.05} / ₀	l ₀		C	D ₀	d ₅	C _T	C _{OT}	C	C _O	M _{A1} *	M _{A2} *	Spline nut g	Spline shaft kg/m
LBS 6	12	0	20	0	20.8	11	11.5	2	0.8	10	0.3	1.2	6	5.3	1.53	2.41	637	785	2.2	19.4	6.6	0.22
LBS 8	16	-0.011	25	-0.2	26.4	14.5	15.5	2.5	1.2	12.5	0.3	1.2	8	7.3	4.07	6.16	1180	1420	5.1	39.6	15.4	0.42
LBS 10	19	⁰ / _{-0.013}	30	—	—	—	—	3	1.5	17	0.3	1.5	10	8.3	7.02	10.4	1620	1960	8.1	67.6	36.7	0.55

Note Models LBS6 and 8 are of end-cap type.
Keep the end caps of models LBS6 and 8 from impact.
THK does not offer a high-temperature type of miniature Ball Spline.

***Note** M_{A1} indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
M_{A2} indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
(Single spline nut configuration is not stable in accuracy. We recommend using two spline nuts in close contact with each other.)

Model number coding

2 LBS6 **UU** **CL** **+200L** **H**

1 2 3 4 5 6

1 Number of spline nuts on one shaft (no symbol for one nut)

2 Model No.

3 Dust prevention accessory symbol - no symbol: without seal

UU: rubber seal attached on both ends of spline nut

U: rubber seal attached on either end of spline nut

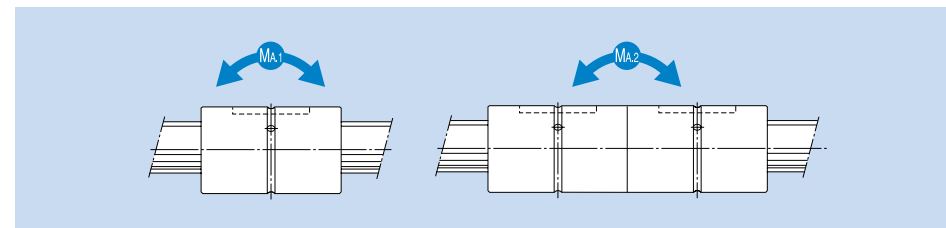
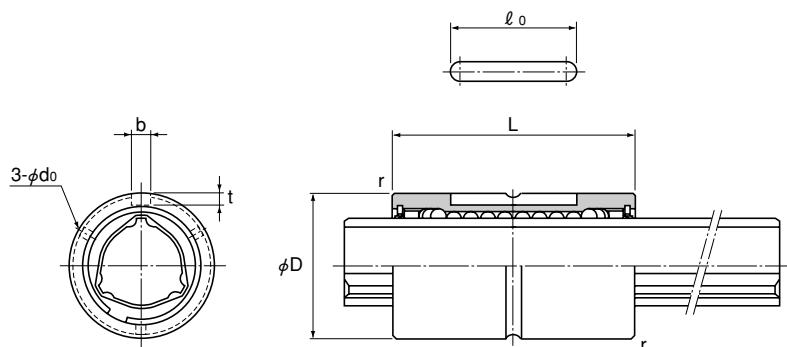
4 Symbol for clearance in the rotational direction (see page b-4)

5 Overall spline shaft length (in mm)

6 Accuracy symbol (see page b-5)

Model LBS

Medium load type



Unit: mm

Model No.	Outer diameter		Spline nut dimensions							Basic torque rating		Basic load rating (radial)		Permissible static moment		Mass	
	D	Tolerance	L	Tolerance	b H8	t +0.05 0	l _o	r	Greasing hole d _o	C _T N·m	C _{OT} N·m	C kN	C _o kN	M _{A1} * N·m	M _{A2} * N·m	Spline nut kg	Spline shaft kg/m
LBS 15	23	0 _{-0.013}	40	0	3.5	2	20	0.5	2	30.4	74.5	4.4	8.4	25.4	185	0.06	1
○●LBS 20	30	0 -0.016	50	-0.2	4	2.5	26	0.5	2	74.5	160	7.8	14.9	60.2	408	0.14	1.8
○●LBS 25	37		60		5	3	33	0.5	2	154	307	13	23.5	118	760	0.25	2.7
○●LBS 30	45	0 -0.019	70	0 -0.3	7	4	41	1	3	273	538	19.3	33.8	203	1270	0.44	3.8
○●LBS 40	60		90		10	4.5	55	1	3	599	1140	31.9	53.4	387	2640	1	6.8
○●LBS 50	75	0 -0.022	100	-0.3	15	5	60	1.5	4	1100	1940	46.6	73	594	4050	1.7	10.6
○●LBS 70	100		110		18	6	68	2	4	2190	3800	66.4	102	895	6530	3.1	21.3
○●LBS 85	120	0 -0.025	140	0	20	7	80	2.5	5	3620	6360	90.5	141	2000	12600	5.5	32
○●LBS 100	140		160		28	9	93	3	5	5910	12600	126	237	3460	20600	9.5	45

Note ○ indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100°C).
(Example) LBS20 A CL+500L H

High temperature type symbol

● indicates model numbers for which felt seal types are available (see page b-8).
A felt seal cannot be attached to Ball Spline models using metal retainer.

***Note** M_{A1} indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.

M_{A2} indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.

(Single LBS-unit configuration is not stable in accuracy. We recommend using a single LBST unit or two LBS units in close contact with each other.)

Model number coding

2 LBS40 UU CL +1000L P K

1 Number of spline nuts on one shaft (no symbol for one nut)

2 Model No.

3 Dust prevention accessory symbol - 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

4 Symbol for clearance in the rotational direction (see page b-4)

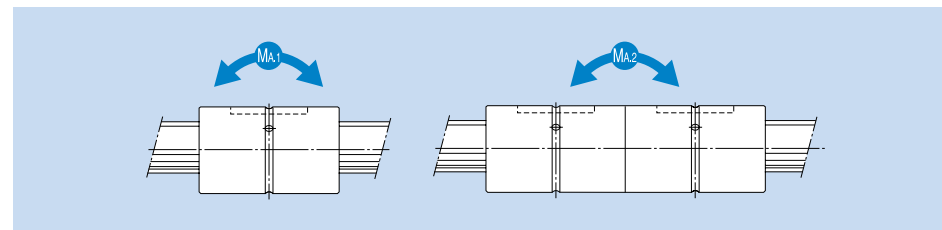
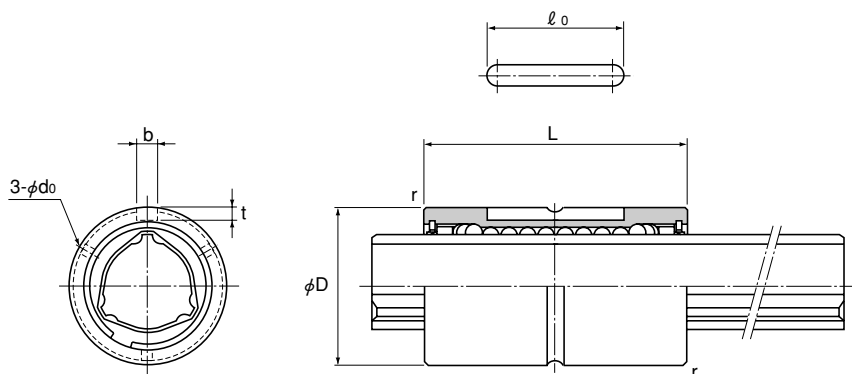
5 Overall spline shaft length (in mm)

6 Accuracy symbol (see page b-5)

7 Symbol for standard hollow spline shaft (see page b-23) (no symbol: solid spline shaft)

Model LBST

Heavy load type



Unit: mm

Model No.	Outer diameter		Spline nut dimensions						Basic torque rating		Basic load rating (radial)		Permissible static moment		Mass		
	D	Tolerance	L	Tolerance	b HB	t +0.05 / 0	l ₀	r	Greasing hole d ₀	C _T N·m	C _{OT} N·m	C kN	C ₀ kN	M _{A1} * N·m	M _{A2} * N·m	Spline nut kg	Spline shaft kg/m
○ ● LBST 20	30	0	60	-0.2	4	2.5	26	0.5	2	90.2	213	9.4	20.1	103	632	0.17	1.8
○ ● LBST 25	37		70		5	3	33	0.5	2	176	381	14.9	28.7	171	1060	0.29	2.7
○ ● LBST 30	45	-0.016	80	0	7	4	41	1	3	312	657	22.5	41.4	295	1740	0.5	3.8
○ ● LBST 40	60	100	10		4.5	55	1	3	696	1420	37.1	66.9	586	3540	1.1	6.8	
○ ● LBST 50	75	-0.019	112	-0.3	15	5	60	1.5	4	1290	2500	55.1	94.1	941	5610	1.9	10.6
○ LBST 60	90	127	18		6	68	1.5	4	1870	3830	66.2	121	1300	8280	3.3	15.6	
○ ● LBST 70	100	-0.022	135	0	18	6	68	2	4	3000	6090	90.8	164	2080	11800	3.8	21.3
○ ● LBST 85	120		155		20	7	80	2.5	5	4740	9550	119	213	3180	17300	6.1	32
○ ● LBST 100	140	0	175	-0.4	28	9	93	3	5	6460	14400	137	271	4410	25400	10.4	45
○ LBST 120	160	-0.025	200		28	9	123	3.5	6	8380	19400	148	306	5490	32400	12.9	69.5
○ LBST 150	205	0 / -0.029	250	-0.5	32	10	157	3.5	6	13900	32200	196	405	8060	55400	28	116.6

Note ○ indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100°C).
 (Example) LBST25 A CM+400L H
 High temperature type symbol
 ● indicates model numbers for which felt seal types are available (see page b-8).
 A felt seal cannot be attached to Ball Spline models using metal retainer.

***Note** M_{A1} indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
 M_{A2} indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.

Model number coding

2 LBST50 UU CM +800L H K

1 Number of spline nuts on one shaft (no symbol for one nut)

2 Model No.

3 Dust prevention accessory symbol - 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

4 Symbol for clearance in the rotational direction (see page b-4)

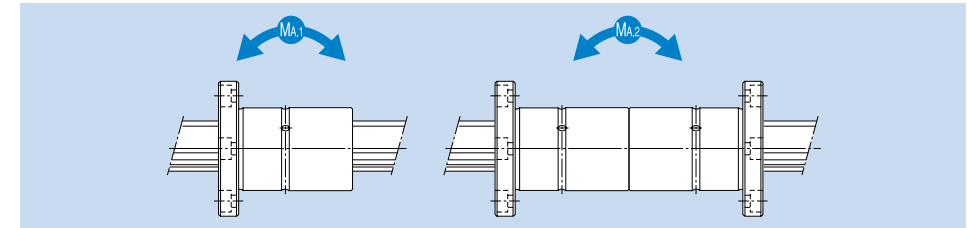
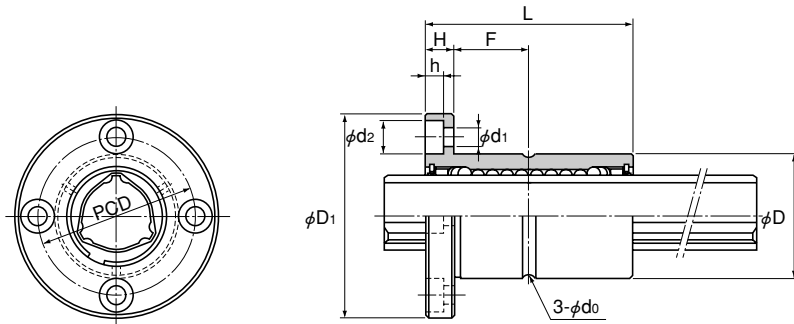
5 Overall spline shaft length (in mm)

6 Accuracy symbol (see page b-5)

7 Symbol for standard hollow spline shaft (see page b-23) (no symbol: solid spline shaft)

Model LBF

Medium load type



Unit: mm

Model No.	Outer diameter		Length		Spline nut dimensions				Mounting hole d ₁ ×d ₂ ×h	Basic torque rating		Basic load rating (radial)		Permissible static moment		Mass			
	D	Tolerance	L	Tolerance	D ₁	Tolerance	H	F		Greasing hole d ₀	PCD	C _T N·m	C _{DT} N·m	C kN	C _D kN	M _{A1} * N·m	M _{A2} * N·m	Spline nut kg	Spline shaft kg/m
LBF 15	23	0 ^{-0.013}	40	0	43	0	7	13	2	32	4.5×8×4.4	30.4	74.5	4.4	8.4	25.4	185	0.11	1
○●LBF 20	30	0	50	-0.2	49	0	7	18	2	38	4.5×8×4.4	74.5	160	7.8	14.9	60.2	408	0.2	1.8
○●LBF 25	37	-0.016	60		60	-0.2	9	21	2	47	5.5×9.5×5.4	154	307	13	23.5	118	760	0.36	2.7
○●LBF 30	45		70		70		10	25	3	54	6.6×11×6.5	273	538	19.3	33.8	203	1270	0.6	3.8
○●LBF 40	57	0	90	0	90		14	31	3	70	9×14×8.6	599	1140	31.9	53.4	387	2640	1.2	6.8
○●LBF 50	70	-0.019	100	-0.3	108		16	34	4	86	11×17.5×11	1100	1940	46.6	73	594	4050	1.9	10.6
○ LBF 60	85		127		124	0	18	45.5	4	102	11×17.5×11	1870	3830	66.2	121	1300	8280	3.5	15.6
○●LBF 70	95	0	110		142	-0.3	20	35	4	117	14×20×13	2190	3800	66.4	102	895	6530	3.6	21.3
○●LBF 85	115	-0.022	140	0	168		22	48	5	138	16×23×15.2	3620	6360	90.5	141	2000	12600	6.2	32
○●LBF 100	135	0 ^{-0.025}	160	-0.4	195	-0.4	25	55	5	162	18×26×17.5	5910	12600	126	237	3460	20600	11	45

Note ○ indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100°C).
 (Example) LBF20 **A** CL+500L H
 High temperature type symbol
 ● indicates model numbers for which felt seal types are available (see page b-8).
 A felt seal cannot be attached to Ball Spline models using metal retainer.

***Note** M_{A1} indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
 M_{A2} indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
 (Single spline nut configuration is not stable in accuracy. We recommend using two spline nuts in close contact with each other.)

Model number coding

2 LBF20 DD CL +900L P K
 1 2 3 4 5 6 7

1 Number of spline nuts on one shaft (no symbol for one nut)

2 Model No.

3 Dust prevention accessory symbol - no symbol: without seal

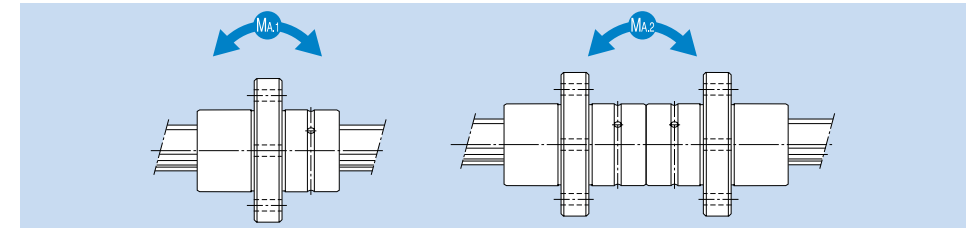
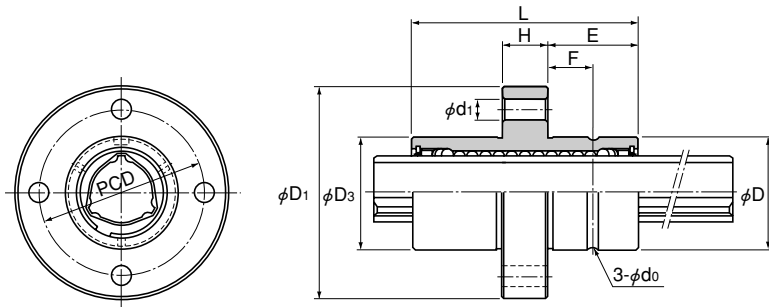
UU: rubber seal attached on both ends of spline nut
 U: rubber seal attached on either end of spline nut
 DD: felt seal attached on both ends of spline nut
 D: felt seal attached on either end of spline nut

4 Symbol for clearance in the rotational direction (see page b-4)

5 Overall spline shaft length (in mm)

6 Accuracy symbol (see page b-5)

7 Symbol for standard hollow spline shaft (see page b-23) (no symbol: solid spline shaft)



Unit: mm

Model No.	Outer diameter		Outer diameter D ₃	Length		Spline nut dimensions				Mounting hole d ₁	F	Greasing hole d ₀	Basic torque rating		Basic load rating (radial)		Permissible static moment		Mass	
	D	Tolerance		L	Tolerance	Flange diameter D ₁	H	E	PCD				C _T	C _{OT}	C	C ₀	M _{A1} *	M _{A2} *	Spline nut	Spline shaft
LBR 15	25	-0.013	25.35	40	0	45.4	9	15.5	34	4.5	7.5	2	30.4	74.5	4.4	8.4	25.4	185	0.14	1
○●LBR 20	30	0	30.35	60	-0.2	56.4	12	24	44	5.5	12	2	90.2	213	9.4	20.1	103	632	0.33	1.8
○●LBR 25	40		40.35	70		70.4	14	28	54	5.5	14	2	176	381	14.9	28.7	171	1060	0.54	2.7
○●LBR 30	45	-0.016	45.4	80	0	75.4	16	32	61	6.6	16	3	312	657	22.5	41.4	295	1740	0.9	3.8
○●LBR 40	60	0	60.4	100		96.4	18	41	78	9	20.5	3	696	1420	37.1	66.9	586	3540	1.7	6.8
○●LBR 50	75	-0.019	75.4	112	-0.3	112.4	20	46	94	11	23	4	1290	2500	55.1	94.1	941	5610	2.7	10.6
○ LBR 60	90	0	90.5	127		134.5	22	52.5	112	11	26	4	1870	3830	66.2	121	1300	8280	3.7	15.6
○●LBR 70	95		-0.022	95.6	135	140.6	24	55.5	117	14	27	4	3000	6090	90.8	164	2080	11800	6	21.3
○●LBR 85	120	-0.025	120.6	155	0	170.6	26	64.5	146	16	32	5	4740	9550	119	213	3180	17300	8.3	32
○●LBR 100	140		140.6	175		-0.4	198.6	34	70.5	170	18	35	5	6460	14400	137	271	4410	25400	14.2

Note ○ indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100°C).
 (Example) LBR40 A CM+600L H
 High temperature type symbol
 ● indicates model numbers for which felt seal types are available (see page b-8).
 A felt seal cannot be attached to Ball Spline models using metal retainer.

***Note** M_{A1} indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
 M_{A2} indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.

Model number coding

2 LBR30 UU CM +700L H K

1 2 3 4 5 6 7

1 Number of spline nuts on one shaft (no symbol for one nut)

2 Model No.

3 Dust prevention accessory symbol - 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

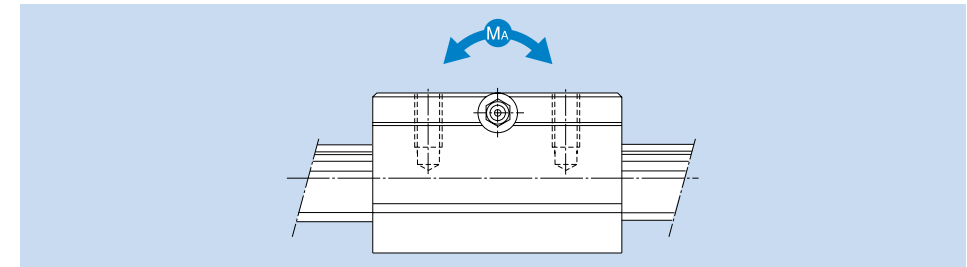
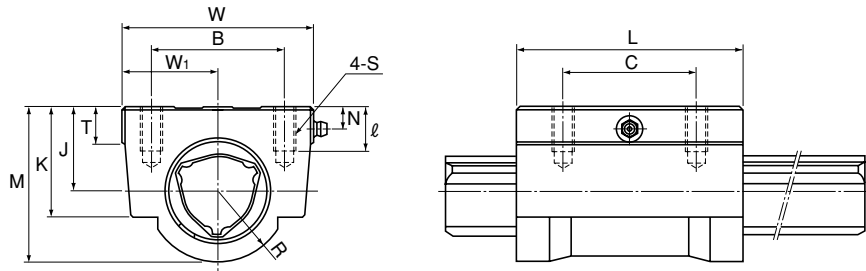
D: felt seal attached on either end of spline nut

4 Symbol for clearance in the rotational direction (see page b-4)

5 Overall spline shaft length (in mm)

6 Accuracy symbol (see page b-5)

7 Symbol for standard hollow spline shaft (see page b-23) (no symbol: solid spline shaft)



Unit: mm

Model No.	Spline nut dimensions										Basic torque rating		Basic load rating (radial)		Permissible static moment M _A * N·m	Mass				
	Height M	Width W	Length L	B	C	SX l	J ±0.15	W ₁ ±0.15	T	K	R	N	C _T N·m	C _{OT} N·m		C kN	C _O kN	Spline nut kg	Spline shaft kg/m	
○ LBH 15	29	34	43	26	26	M4X10	15	17	6	20	14	5	φ4 drive nipple	30.4	74.5	4.4	8.4	25.4	0.23	1
○● LBH 20	38	48	62	35	35	M6X12	20	24	7	26	18	7	A-M6F	90.2	213	9.4	20.1	103	0.58	1.8
○● LBH 25	47.5	60	73	40	40	M8X16	25	30	8	33	22	6	A-M6F	176	381	14.9	28.7	171	1.1	2.7
○● LBH 30	57	70	83	50	50	M8X16	30	35	10	39	26	8	A-M6F	312	657	22.5	41.4	295	1.73	3.8
○● LBH 40	70	86	102	60	60	M10X20	38	43	15	50	32	10	A-M6F	696	1420	37.1	66.9	586	3.18	6.8
○● LBH 50	88	100	115	75	75	M12X25	48	50	18	63	40	13.5	A-PT1/8	1290	2500	55.1	94.1	941	5.1	10.6

- Note** ○ indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100°C).
(Example) LBH30 A CM+600L H
└ High temperature type symbol
- indicates model numbers for which felt seal types are available (see page b-8).
A felt seal cannot be attached to Ball Spline models using metal retainer.

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

Model number coding

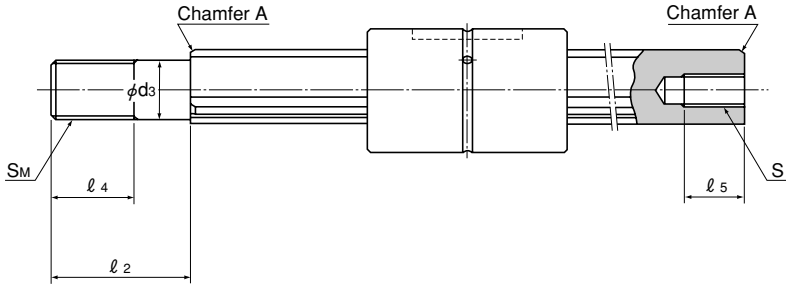
2 LBH40 UU CL +700L P K

1 2 3 4 5 6 7

- 1 Number of spline nuts on one shaft (no symbol for one nut)
- 2 Model No.
- 3 Dust prevention accessory symbol - 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
- 4 Symbol for clearance in the rotational direction (see page b-4)
- 5 Overall spline shaft length (in mm)
- 6 Accuracy symbol (see page b-5)
- 7 Symbol for standard hollow spline shaft (see page b-23) (no symbol: solid spline shaft)

Model LBS with Recommended Shaft End Shape

For support



Unit: mm

Model No.	d_3	Tolerance	l_2	S_M	l_4	$S \times l_5$
LBS 15	10	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	23	M10×1.25	14	M6×10
LBS 20	14	0	30	M14×1.5	18	M8×15
LBS 25	18	-0.018	42	M18×1.5	25	M10×18
LBS 30	20	0	46	M20×1.5	27	M12×20
LBS 40	30	-0.021	70	M30×2	40	M18×30
LBS 50	36	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	80	M36×3	46	M20×35

Note For details of chamfer A, see page b-24.