Medium Torque Type Ball Spline

Models LT, LF, LT-X, LF-X, LFK-X, and LFH-X

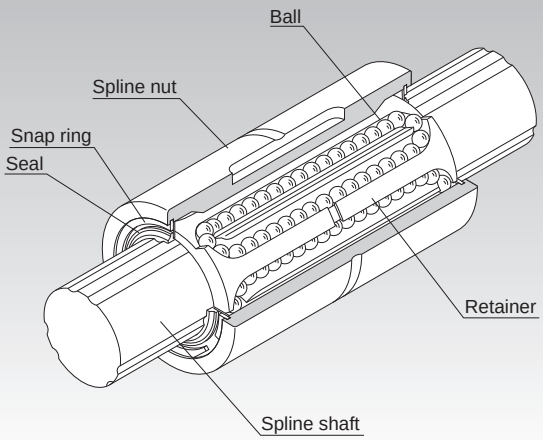


Fig.1 Structure of Medium Torque Type Ball Spline Model LT

Structure and Features

With the medium torque type Ball Spline, the spline shaft has two to three crests on the circumference, and along both sides of each crest, two rows of balls (four or six rows in total) are arranged to hold the crest so that a reasonable preload is applied.
The rows of balls are held in a special resin retainer incorporated in the spline nut so that they smoothly roll and circulate. With this design, balls will not fall even if the nut is removed from the spline shaft.

[Large Load Capacity]
The raceways are formed into circular-arc grooves approximate to the ball curvature and ensure angular contact. Thus, this model has a large load capacity in the radial and torque directions.

[No Angular Backlash]
Two rows of balls facing one another hold a crest, formed on the circumference of the spline nut, at a contact angle of 20° to provide a preload in an angular-contact structure. This eliminates an angular backlash in the rotational direction and increases the rigidity.

[High Rigidity]
Since the contact angle is large and an appropriate preload is given, high rigidity against torque and moment is achieved.

[Ball Retaining Type]
Use of a retainer prevents the balls from falling even if the spline shaft is pulled out of the spline nut. (except for models LT4 and 5)

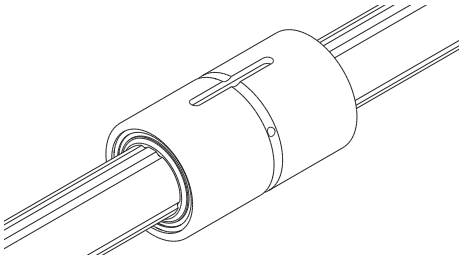
Types and Features

[Types of Spline Nuts]

Cylindrical Type Ball Spline Model LT

Specification Table⇒A3-82

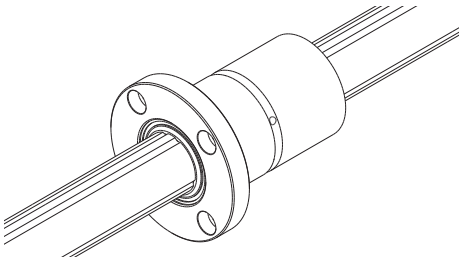
The most compact type with a straight cylindrical spline nut. When transmitting a torque, a key is driven into the body.



Flanged Type Ball Spline Model LF

Specification Table⇒A3-84

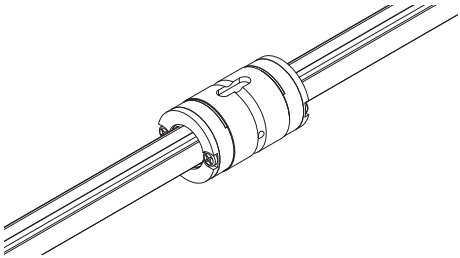
The spline nut can be attached to the housing via the flange, making assembly simple.
It is optimal for locations where the housing may be deformed if a keyway is machined on its surface, and where the housing width is small.



Model LT-X Miniature Ball Spline

Specification Table⇒A3-86

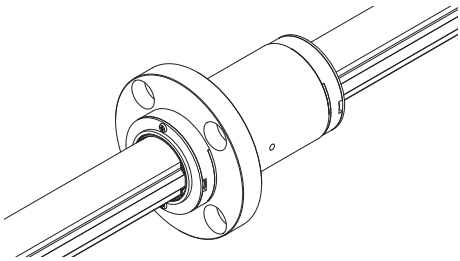
The nut is more compact than that of the current Model LT thanks to the new circulating pathways.
The outer diameter of the nut is the same as that of the linear bushing.
The Model LT-XL is suitable for moment loads, torque, and overhung loads that exceed those tolerated by the Model LT-X.



Model LF-X Miniature Ball Spline

Specification Table⇒A3-88

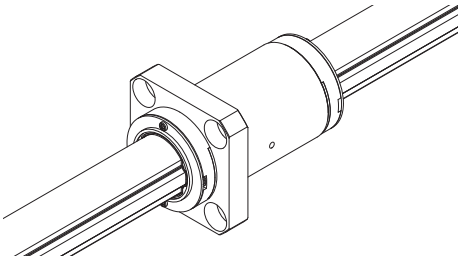
The nut is more compact than that of the current Model LF thanks to the new circulating pathways.
The outer diameter of the nut is the same as that of the linear bushing.
The Model LF-XL is suitable for moment loads, torque, and overhung loads that exceed those tolerated by the Model LF-X.



Model LFK-X Miniature Ball Spline

Specification Table⇒A3-90

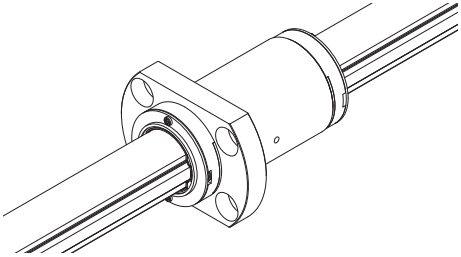
The flange is similar to the Model LF-X, but flattened in four places. Compared to models with round flanges, its core height is lower, and it allows for more compact designs.
The Model LFK-XL is suitable for moment loads or torque and overhang loads that exceed those tolerated by the Model LFK-X.



Model LFH-X Miniature Ball Spline

Specification Table⇒A3-92

The flange is similar to the Model LF-X, but flattened in two places. Compared to models with square flanges, its core height is lower, and it allows for a lighter overall design.
The Model LFH-XL is suitable for moment loads or torque and overhang loads that exceed those tolerated by the Model LFH-X.



[Types of Spline Shafts]

Precision Solid Spline Shaft (Standard Type)

The raceway of the spline shaft is precision ground. It is used in combination with a spline nut.

Special Spline 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.

Thick

Hollow Spline Shaft (Type N)

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

Thin

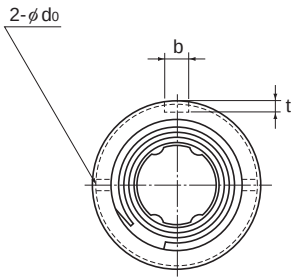
Housing Inner-diameter Tolerance

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

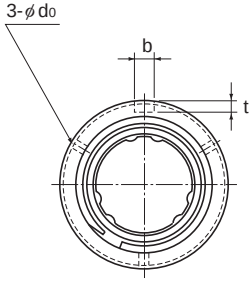
Table1 Housing Inner-diameter Tolerance

Housing Inner-diameter Tolerance	General conditions	H7
	When clearance needs to be small	J6

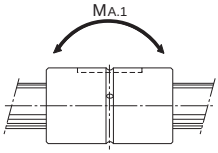
Model LT



Model LT13 or smaller



Model LT16 or greater



Model No.	Spline nut dimensions								
	Outer diameter		Length		b H8	Keyway dimensions		r	Greasing hole
	D	Tolerance	L	Tolerance		t +0.1 0	ℓ0		d0
Note) LT 4	10	0 −0.009	16	0 −0.2	2	1.2	6	0.5	—
Note) LT 5	12	0 −0.011	20		2.5	1.2	8	0.5	—
LT 6	14		25		2.5	1.2	10.5	0.5	1
LT 8	16		25		2.5	1.2	10.5	0.5	1.5
LT 10	21	0 −0.013	33		3	1.5	13	0.5	1.5
LT 13	24		36		3	1.5	15	0.5	1.5
○ LT 16	31		50		3.5	2	17.5	0.5	2
○ LT 20	35	0 −0.016	63		4	2.5	29	0.5	2
○ LT 25	42		71	0 −0.3	4	2.5	36	0.5	3
○ LT 30	47		80		4	2.5	42	0.5	3
○ LT 40	64	0 −0.019	100		6	3.5	52	0.5	4
○ LT 50	80		125		8	4	58	1	4
○ LT 60	90	0 −0.022	140	0 −0.4	12	5	67	1	5
○ LT 80	120		160		16	6	76	2	5
○ LT 100	150	0 −0.025	185		20	7	110	2.5	5

Note) Models LT4 and 5 do not have a retainer. Do not remove the shaft from the spline nut. (It will cause balls to fall off.)
○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

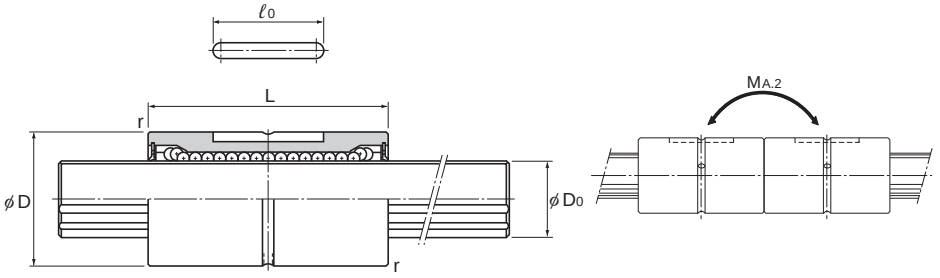
(Example) LT20 A CL+500L H
High temperature symbol

Model number coding

2 LT30 UU CL +500L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LT30: Model No.
- UU: Contamination protection accessory symbol (*1)
- CL: Symbol for clearance in the rotational direction (*2)
- +500L: Overall spline shaft length (in mm) (*5)
- H: Accuracy symbol (*3)
- K: Symbol for spline shaft (*4)

(*1) See A3-128. (*2) See A3-30. (*3) See A3-35. (*4) See A3-95. (*5) See A3-123.



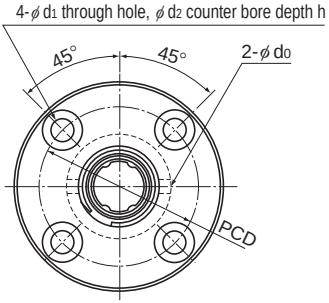
Unit: mm

	Spline shaft diameter	Rows of balls	Basic torque rating		Basic Load Rating		Static permissible moment		Mass	
	D_0 h7		C_T N•m	C_{0T} N•m	C kN	C_0 kN	$M_{A.1}$** N•m	$M_{A.2}$** N•m	Spline Nut g	Spline shaft kg/m
	4	4	0.59	0.78	0.44	0.61	0.88	6.4	5.2	0.1
	5	4	0.88	1.37	0.66	0.88	1.5	11.6	9.1	0.15
	6	4	0.98	1.96	1.18	2.16	4.9	36.3	17	0.23
	8	4	1.96	2.94	1.47	2.55	5.9	44.1	18	0.4
	10	4	3.92	7.84	2.84	4.9	15.7	98	50	0.62
	13	4	5.88	10.8	3.53	5.78	19.6	138	55	1.1
	16	6	31.4	34.3	7.06	12.6	67.6	393	165	1.6
	20	6	56.9	55.9	10.2	17.8	118	700	225	2.5
	25	6	105	103	15.2	25.8	210	1140	335	3.9
	30	6	171	148	20.5	34	290	1710	375	5.6
	40	6	419	377	37.8	60.5	687	3760	1000	9.9
	50	6	842	769	60.9	94.5	1340	7350	1950	15.5
	60	6	1220	1040	73.5	111.7	1600	9990	2500	22.3
	80	6	2310	1920	104.9	154.8	2510	16000	4680	39.6
	100	6	3730	3010	136.2	195	3400	24000	9550	61.8

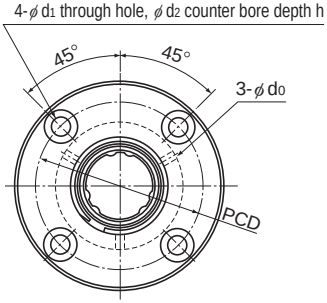
Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see A3-123.

Options⇒A3-128

Model LF



Model LF13 or smaller



Model LF16 or greater

Model No.	Spline nut dimensions													
	Outer diameter		Length		Flange diameter		H	F	C	r	Greasing hole	PCD	Mounting hole	
	D	Tolerance	L	Tolerance	D_1	Tolerance					d_0		$d_1 \times d_2 \times h$	
LF 6	14	0 −0.011	25	0 −0.2	30	0 −0.2	5	7.5	0.5	0.5	1.5	22	3.4×6.5×3.3	
LF 8	16		25		32		5	7.5	0.5	0.5	1.5	24	3.4×6.5×3.3	
LF 10	21	0 −0.013	33		42		6	10.5	0.5	0.5	1.5	32	4.5×8×4.4	
LF 13	24		36		44		7	11	0.5	0.5	1.5	33	4.5×8×4.4	
○ LF 16	31		50		51		7	18	0.5	0.5	2	40	4.5×8×4.4	
○ LF 20	35	0 −0.016	63		58		9	22.5	0.5	0.5	2	45	5.5×9.5×5.4	
○ LF 25	42		71	0 −0.3	65		9	26.5	0.5	0.5	3	52	5.5×9.5×5.4	
○ LF 30	47		80		75		10	30	0.5	0.5	3	60	6.6×11×6.5	
○ LF 40	64	0 −0.019	100		100		14	36	1	0.5	4	82	9×14×8.6	
○ LF 50	80		125		124		16	46.5	1	1	4	102	11×17.5×11	

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

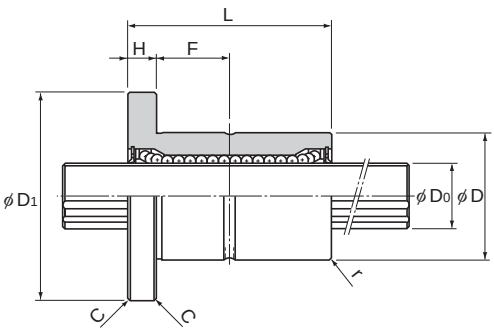
(Example) LF30 A CL+700L H
High temperature symbol

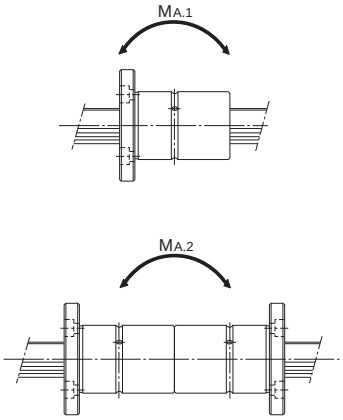
Model number coding

2 LF20 UU CM +400L P N

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LF20: Model No.
- UU: Contamination protection accessory symbol (*1)
- CM: Symbol for clearance in the rotational direction (*2)
- +400L: Overall spline shaft length (in mm) (*5)
- P: Accuracy symbol (*3)
- N: Symbol for spline shaft (*4)

(*1) See A3-128. (*2) See A3-30. (*3) See A3-35. (*4) See A3-95. (*5) See A3-123.





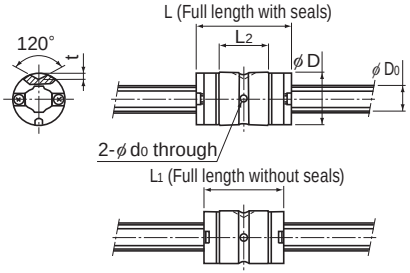
Unit: mm

	Spline shaft diameter	Rows of balls	Basic torque rating		Basic load rating		Static permissible moment		Mass	
	D_0 h7		C_T N•m	C_{0T} N•m	C kN	C_0 kN	$M_{A.1}$** N•m	$M_{A.2}$** N•m	Spline Nut g	Spline shaft kg/m
	6	4	0.98	1.96	1.18	2.16	4.9	36.3	35	0.23
	8	4	1.96	2.94	1.47	2.55	5.9	44.1	37	0.4
	10	4	3.92	7.84	2.84	4.9	15.7	98	90	0.62
	13	4	5.88	10.8	3.53	5.78	19.6	138	110	1.1
	16	6	31.4	34.3	7.06	12.6	67.6	393	230	1.6
	20	6	56.9	55.9	10.2	17.8	118	700	330	2.5
	25	6	105	103	15.2	25.8	210	1140	455	3.9
	30	6	171	148	20.5	34	290	1710	565	5.6
	40	6	419	377	37.8	60.5	687	3760	1460	9.9
	50	6	842	769	60.9	94.5	1340	7350	2760	15.5

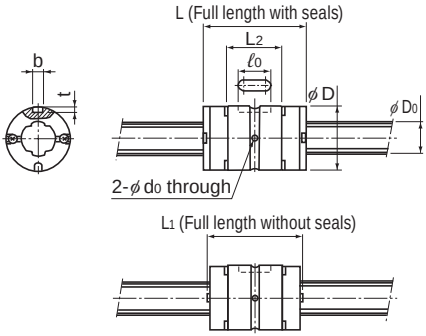
Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see A3-123.

Options⇒A3-128

Model LT-X



LT4X



LT5X, LT5XL, LT6X
LT6XL, LT8X, LT8XL

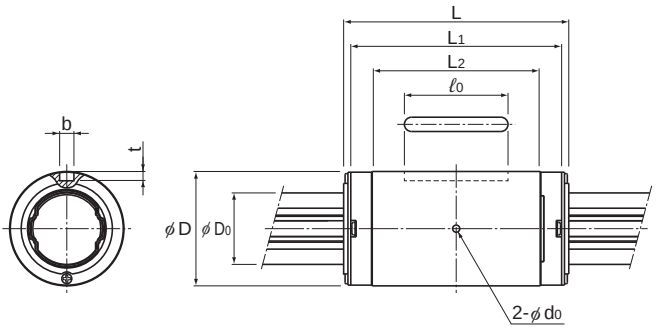
Model No.	Spline shaft diameter	Spline nut dimensions								
		Outer diameter		Length			Keyway dimensions			Greasing hole
	D_0 h7	D	Tolerance	L (With seals)	L_1 (Without seals)	L_2	b H8	t	ℓ_0	d_0
LT 4X	4	8	0 −0.009	14.4	12	7.5	—	1	—	1
LT 5X LT 5XL	5	10	0 −0.009	15 26	13.6 24.6	7.3 18.3	2	1.2	4.7	1 1
LT 6X LT 6XL	6	12	0 −0.011	19 30	17.6 28.6	10.2 21.2	2	1.2	6	1 1
LT 8X LT 8XL	8	15	0 −0.011	25 40	23.8 38.8	14.6 29.6	2.5	1.2	8	1 1
LT 10X	10	19	0 −0.013	33	30.8	23.9	3	1.5	13	1.5
LT 13X	13	23	0 −0.013	36	32.4	24	3	1.5	15	1.5
LT 16X	16	28	0 −0.013	50	46.4	35.5	3.5	2	17.5	2
LT 20X	20	32	0 −0.016	63	59	47.4	4	2.5	29	2
LT 25X	25	40	0 −0.016	71	67	52.6	4	2.5	36	3
LT 30X	30	45	0 −0.016	80	75.6	59.6	4	2.5	42	3

Model number coding

2 LT20X UU CL +700L P K

- **2**: Number of spline nuts on one shaft (no symbol for one nut)
- **LT20X**: Model No.
- **UU**: Contamination protection accessory symbol (*1)
- **CL**: Symbol for clearance in the rotational direction (*2)
- **+700L**: Overall spline shaft length (*5) (in mm)
- **P**: Accuracy symbol (*3)
- **K**: Symbol for spline shaft (*4)

(*1) See A3-128. (*2) See A3-30. (*3) See A3-35. (*4) See A3-95. (*5) See A3-123.



LT10X to 30X

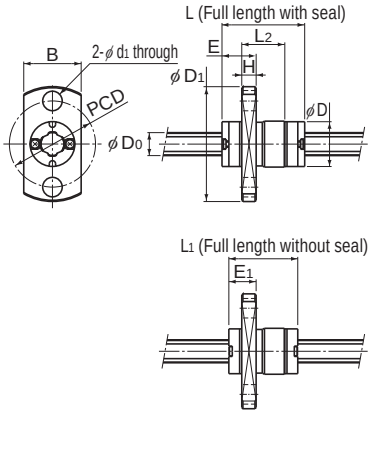
Unit: mm

	Basic torque rating		Basic load rating		Static permissible moment			Mass	
	C_T N•m	C_{0T} N•m	C kN	C_0 kN	M_{A1} N•m	M_{A2} (With seal) N•m	M_{A2} (Without seal) N•m	Spline Nut g	Spline shaft kg/m
	0.49	0.82	0.42	0.7	0.84	6.2	5.0	2.2	0.1
	0.82 1.59	1.25 3.20	0.56 1.09	0.85 2.19	1.04 6.11	8.2 35.5	6.6 28.4	3.3 8	0.15
	1.73 2.81	2.77 5.54	0.98 1.60	1.58 3.15	2.85 10.6	19 59.8	15.2 47.8	6.6 13.3	0.21
	6.00 10.10	9.23 19.5	1.39 2.35	2.15 4.53	5.13 21.1	34.3 110.9	27.4 88.7	14.3 24.3	0.38
	9.41	17.3	2.94	5.40	21.5	114	104	30	0.59
	17.1	28.7	4.16	6.96	28.9	164	149	40	1.01
	42.9	68.6	8.40	13.4	77.4	419	381	81	1.52
	66.4	117	10.5	18.6	144	735	669	130	2.41
	125	207	15.9	26.2	230	1183	1077	235	3.71
	196	319	20.8	34.0	335	1714	1560	295	5.37

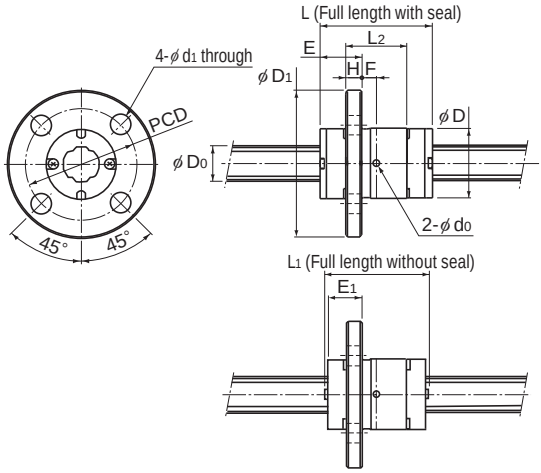
Note) The mass of the spline nut does not include the seal.
Please check the spline shaft strength tests (A3-12) before use.

Options⇒A3-128

Model LF-X



LF4X



LF5X, LF5XL, LF6X, LF6XL, LF8X, LF8XL

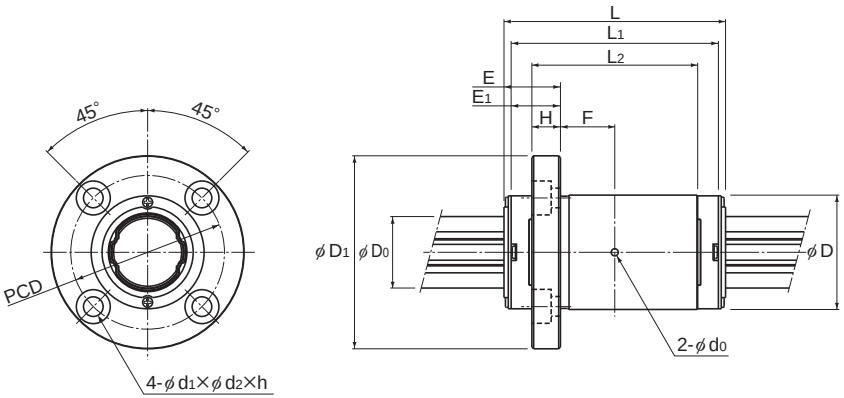
Model No.	Spline shaft diameter	Spline nut dimensions												
		Outer diameter		Length			Flange Outer Diameter						Greasing hole	
	D_0 h7	D	Tolerance	L (With seal)	L_1 (Without seal)	L_2	D_1	B	H	F	E	E_1	d_0	PCD
LF 4X	4	8	0 −0.009	14.4	12	7.5	20	10	2.5	—	5.95	4.75	—	15
LF 5X LF 5XL	5	10	0 −0.009	15 26	13.6 24.6	7.3 18.3	23	—	2.7	— 6.5	6.55	5.35	— 1	17
LF 6X LF 6XL	6	12	0 −0.011	19 30	17.6 28.6	10.2 21.2	25	—	2.7	2.4 7.9	7.1	5.9	1 —	19
LF 8X LF 8XL	8	15	0 −0.011	25 40	23.8 38.8	14.6 29.6	28	—	3.8	3.5 11	9	7.5	1.5	22
LF 10X	10	19	0 −0.013	33	30.8	23.9	38	—	6	5.95	10.55	9.45	1.5	28
LF 13X	13	23	0 −0.013	36	32.4	24	43	—	6	6	12	10.2	1.5	33
LF 16X	16	28	0 −0.013	50	46.4	35.5	48	—	6	11.7	13.3	11.5	2	38
LF 20X	20	32	0 −0.016	63	59	47.4	54	—	8	15.7	15.8	13.8	2	43
LF 25X	25	40	0 −0.016	71	67	52.6	62	—	8	18.3	17.2	15.2	3	51
LF 30X	30	45	0 −0.016	80	75.6	59.6	74	—	10	19.8	20.2	18	3	60

Model number coding

2 LF20X UU CL +700L P K

- **2**: Number of spline nuts on one shaft (no symbol for one nut)
- **LF20X**: Model No.
- **UU**: Contamination protection accessory symbol (*1)
- **CL**: Symbol for clearance in the rotational direction (*2)
- **+700L**: Overall spline shaft length (*5) (in mm)
- **P**: Accuracy symbol (*3)
- **K**: Symbol for spline shaft (*4)

(*1) See **A3-128**. (*2) See **A3-30**. (*3) See **A3-35**. (*4) See **A3-95**. (*5) See **A3-123**.



LF10X to 30X

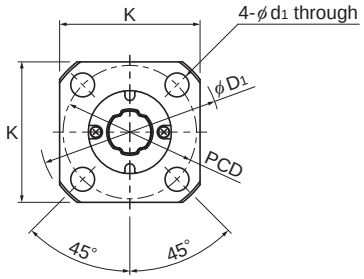
Unit: mm

	Mounting hole	Basic torque rating		Basic load rating		Static permissible moment			Mass	
	$d_1 \times d_2 \times h$	C_T N•m	C_{0T} N•m	C kN	C_0 kN	M_{A1} N•m	M_{A2} (With seal) N•m	M_{A2} (Without seal) N•m	Spline Nut g	Spline shaft kg/m
	3.4 through	0.49	0.82	0.42	0.7	0.84	6.2	4.9	4.7	0.1
	3.4 through	0.82 1.59	1.25 3.20	0.56 1.09	0.85 2.19	1.04 6.11	8.2 35.5	6.5 28.4	9.9 14.6	0.15
	3.4 through	1.73 2.81	2.77 5.54	0.98 1.60	1.58 3.15	2.85 10.6	19 59.8	15.2 47.8	13.8 20.5	0.21
	3.4 through	6.00 10.10	9.23 19.5	1.39 2.35	2.15 4.53	5.13 21.1	34.3 110.9	27.4 88.7	26.5 36.5	0.38
	4.5×8×4.4	9.41	17.3	2.94	5.40	21.5	114	104	66	0.59
	4.5×8×4.4	17.1	28.7	4.16	6.96	28.9	164	149	82	1.01
	4.5×8×4.4	42.9	68.6	8.40	13.4	77.4	419	381	131	1.52
	5.5×9.5×5.4	66.4	117	10.5	18.6	144	735	669	212	2.41
	5.5×9.5×5.4	125	207	15.9	26.2	230	1183	1077	335	3.71
	6.6×11×6.5	196	319	20.8	34.0	335	1714	1560	489	5.37

Note) The mass of the spline nut does not include the seal.
Please check the spline shaft strength tests (**A3-12**) before use.

Options⇒A3-128

Model LFK-X



LFK5X to LFK8X

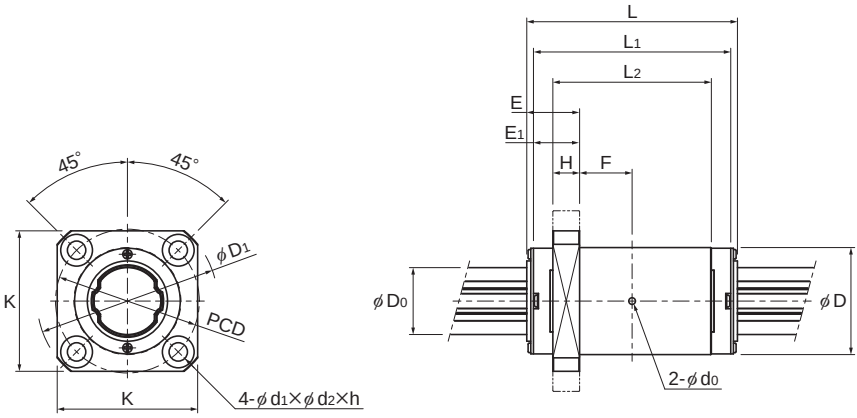
Model No.	Spline shaft diameter	Spline nut dimensions												
		Outer diameter		Length			Flange outer diameter						Greasing hole	
	D_0 h7	D	Tolerance	L (With seal)	L_1 (Without seal)	L_2	D_1	K	H	F	E	E_1	d_0	PCD
LFK 5X LFK 5XL	5	10	0 −0.009	15 26	13.6 24.6	7.3 18.3	23	18	2.7	— 6.5	6.55	5.35	— 1	17
LFK 6X LFK 6XL	6	12	0 −0.011	19 30	17.6 28.6	10.2 21.2	25	20	2.7	2.4 7.9	7.1	5.9	1	19
LFK 8X LFK 8XL	8	15	0 −0.011	25 40	23.8 38.8	14.6 29.6	28	22	3.8	3.5 11	9	7.5	1.5	22
LFK 10X	10	19	0 −0.013	33	30.8	23.9	38	30	6	5.95	10.55	9.45	1.5	28
LFK 13X	13	23	0 −0.013	36	32.4	24	43	34	6	6	12	10.2	1.5	33
LFK 16X	16	28	0 −0.013	50	46.4	35.5	48	37	6	11.7	13.3	11.5	2	38
LFK 20X	20	32	0 −0.016	63	59	47.4	54	42	8	15.7	15.8	13.8	2	43
LFK 25X	25	40	0 −0.016	71	67	52.6	62	50	8	18.3	17.2	15.2	3	51
LFK 30X	30	45	0 −0.016	80	75.6	59.6	74	58	10	19.8	20.2	18	3	60

Model number coding

2 LFK20X UU CL +700L P K

- **2**: Number of spline nuts on one shaft (no symbol for one nut)
- **LFK20X**: Model No.
- **UU**: Contamination protection accessory symbol (*1)
- **CL**: Symbol for clearance in the rotational direction (*2)
- **+700L**: Overall spline shaft length (*5) (in mm)
- **P**: Accuracy symbol (*3)
- **K**: Symbol for spline shaft (*4)

(*1) See A3-128. (*2) See A3-30. (*3) See A3-35. (*4) See A3-95. (*5) See A3-123.



LFK10X to LFK30X

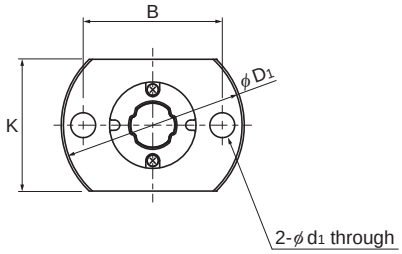
Unit: mm

	Mounting hole	Basic torque rating		Basic load rating		Static permissible moment			Mass	
	$d_1 \times d_2 \times h$	C_T N•m	C_{0T} N•m	C kN	C_0 kN	M_{A1} N•m	M_{A2} (With seal) N•m	M_{A2} (Without seal) N•m	Spline Nut g	Spline shaft kg/m
	3.4 through	0.82 1.59	1.25 3.20	0.56 1.09	0.85 2.19	1.04 6.11	8.2 35.5	6.6 28.4	7.9 12.6	0.15
	3.4 through	1.73 2.81	2.77 5.54	0.98 1.60	1.58 3.15	2.85 10.6	19.0 59.8	15.2 47.8	11.6 18.3	0.21
	3.4 through	6.00 10.1	9.23 19.5	1.39 2.35	2.15 4.53	5.13 21.1	34.3 110.9	27.4 88.7	22.3 32.3	0.38
	4.5×8×4.4	9.41	17.3	2.94	5.40	21.5	114	104	54	0.59
	4.5×8×4.4	17.1	28.7	4.16	6.96	28.9	164	149	67	1.01
	4.5×8×4.4	42.9	68.6	8.40	13.4	77.4	419	381	110	1.52
	5.5×9.5×5.4	66.4	117	10.5	18.6	144	735	669	177	2.41
	5.5×9.5×5.4	125	207	15.9	26.2	230	1183	1077	298	3.71
	6.6×11×6.5	196	319	20.8	34.0	335	1714	1560	411	5.37

Note) The mass of the spline nut does not include the seal.
Please check the spline shaft strength tests (A3-12) before use.

Options⇒A3-128

Model LFH-X



LFH5X to LFH13X

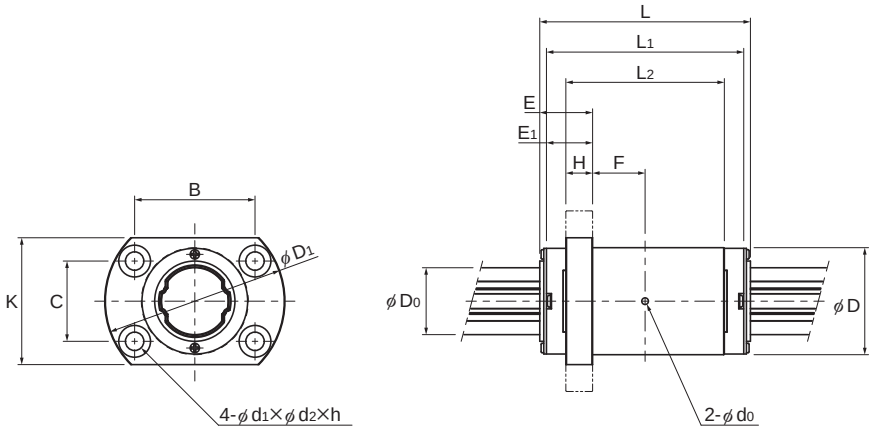
Model No.	Spline shaft diameter	Spline nut dimensions														
		Outer diameter		Length			Flange outer diameter									Greasing hole
	D_0 h7	D	Tolerance	L (With seal)	L_1 (Without seal)	L_2	D_1	K	B	C	H	F	E	E_1	d_0
LFH 5X LFH 5XL	5	10	0 −0.009	15 26	13.6 24.6	7.3 18.3	23	16	17	—	2.7	— 6.5	6.55	5.35	— 1
LFH 6X LFH 6XL	6	12	0 −0.011	19 30	17.6 28.6	10.2 21.2	25	18	19	—	2.7	2.4 7.9	7.1	5.9	1
LFH 8X LFH 8XL	8	15	0 −0.011	25 40	23.8 38.8	14.6 29.6	28	21	22	—	3.8	3.5 11	9	7.5	1.5
LFH 10X	10	19	0 −0.013	33	30.8	23.9	38	25	29	—	6	5.95	10.55	9.45	1.5
LFH 13X	13	23	0 −0.013	36	32.4	24	43	29	33	—	6	6	12	10.2	1.5
LFH 16X	16	28	0 −0.013	50	46.4	35.5	48	34	31	22	6	11.7	13.3	11.5	2
LFH 20X	20	32	0 −0.016	63	59	47.4	54	38	36	24	8	15.7	15.8	13.8	2
LFH 25X	25	40	0 −0.016	71	67	52.6	62	46	40	32	8	18.3	17.2	15.2	3
LFH 30X	30	45	0 −0.016	80	75.6	59.6	74	51	49	35	10	19.8	20.2	18	3

Model number coding

2 LFH20X UU CL +700L P K

- **2**: Number of spline nuts on one shaft (no symbol for one nut)
- **LFH20X**: Model No.
- **UU**: Contamination protection accessory symbol (*1)
- **CL**: Symbol for clearance in the rotational direction (*2)
- **+700L**: Overall spline shaft length (*5) (in mm)
- **P**: Accuracy symbol (*3)
- **K**: Symbol for spline shaft (*4)

(*1) See A3-128. (*2) See A3-30. (*3) See A3-35. (*4) See A3-95. (*5) See A3-123.



LFH16X to LFH30X

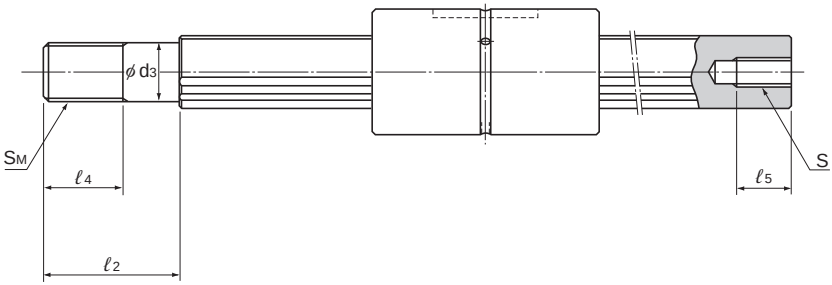
Unit: mm

	Mounting hole	Basic torque rating		Basic load rating		Static permissible moment			Mass	
	$d_1 \times d_2 \times h$	C_T N•m	C_{0T} N•m	C kN	C_0 kN	M_{A1} N•m	M_{A2} (With seal) N•m	M_{A2} (Without seal) N•m	Spline Nut g	Spline shaft kg/m
	3.4 through	0.82 1.59	1.25 3.20	0.56 1.09	0.85 2.19	1.04 6.11	8.2 35.5	6.6 28.4	8.6 13.3	0.15
	3.4 through	1.73 2.81	2.77 5.54	0.98 1.60	1.58 3.15	2.85 10.6	19.0 59.8	15.2 47.8	12.4 19.1	0.21
	3.4 through	6.00 10.1	9.23 19.5	1.39 2.35	2.15 4.53	5.13 21.1	34.3 110.9	27.4 88.7	24.4 34.4	0.38
	4.5 through	9.41	17.3	2.94	5.40	21.5	114	104	59	0.59
	4.5 through	17.1	28.7	4.16	6.96	28.9	164	149	71	1.01
	4.5×8×4.4	42.9	68.6	8.40	13.4	77.4	419	381	116	1.52
	5.5×9.5×5.4	66.4	117	10.5	18.6	144	735	669	186	2.41
	5.5×9.5×5.4	125	207	15.9	26.2	230	1183	1077	306	3.71
	6.6×11×6.5	196	319	20.8	34.0	335	1714	1560	422	5.37

Note) The mass of the spline nut does not include the seal.
Please check the spline shaft strength tests (A3-12) before use.

Options⇒A3-128

Model LT with Recommended Shaft End Shape



Unit: mm

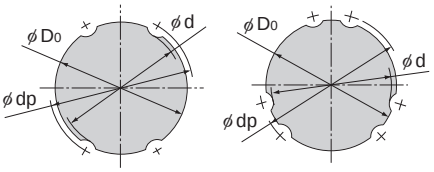
Model No.	d_3	Tolerance	ℓ_2	S_M	ℓ_4	$S \times \ell_5$
LT 6	5	0 –0.012	12	M5×0.8	7	M2.5×4
LT 8	6		14	M6×1	8	M3×5
LT 10	8	0 –0.015	18	M8×1	11	M4×6
LT 13	10		23	M10×1.25	14	M5×8
LT 16	14	0 –0.018	30	M14×1.5	18	M6×10
LT 20	16		38	M16×1.5	22	M8×15
LT 25	22	0 –0.021	50	M22×1.5	28	M10×18
LT 30	27		60	M27×2	34	M14×25
LT 40	36	0 –0.025	80	M36×3	45	M18×30
LT 50	45		100	M45×4.5	58	M22×40

Spline Shaft

Spline shafts are divided in shape into precision solid spline shafts, special spline shafts, and hollow spline shafts (types K and N), as described on A3-81.
Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when requesting an estimate or placing an order.

[Sectional Shape of the Spline Shaft]

Table2 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (ϕd) value should not be exceeded if possible.



Model LT13 or smaller Model LT16 or greater

Table2 Cross-Sectional Shape of the Spline Shaft for Models LT and LF

Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30	40	50	60	80	100
Minor diameter ϕd	3.5	4.5	5	7	8.5	11.5	14.5	18.5	23	28	37.5	46.5	56.5	75.5	95
Major diameter ϕD_0 h7	4	5	6	8	10	13	16	20	25	30	40	50	60	80	100
Ball center-to-center diameter ϕdp	4.6	5.7	7	9.3	11.5	14.8	17.8	22.1	27.6	33.2	44.2	55.2	66.3	87.9	109.5
Mass(kg/m)	0.1	0.15	0.23	0.4	0.62	1.1	1.6	2.5	3.9	5.6	9.9	15.5	22.3	39.6	61.8

*The minor diameter ϕd must be a value at which no groove is left after machining.

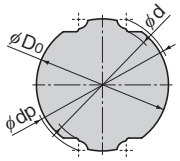


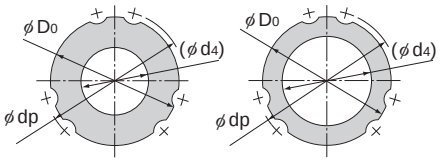
Table3 Cross-Sectional Shape of the Spline Shaft for Models LT-X, LF-X, LFK-X, and LFH-X

Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30
Minor diameter ϕ d	3.6	4.5	5.4	7	8.6	11.3	13.9	17.9	22.4	27
Major diameter ϕ D_0	4	5	6	8	10	13	16	20	25	30
Ball center-to-center diameter ϕ dp	4.4	5.5	6.6	8.6	10.7	13.8	17.1	21.1	26.4	31.6
Mass (g/m)	100	150	210	380	590	1010	1520	2410	3710	5370

[Hole Shape of the Standard Hollow Type Spline Shaft]

Table4 shows the hole shape of the standard hollow type spline shaft (types K and N).
Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.

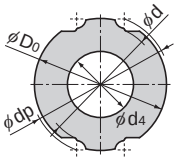


Type K (Thick)　　Type N (Thin)

Table4 Cross-Sectional Shape of the Standard Hollow Spline Shaft for Models LT and LF　　Unit: mm

Nominal shaft diameter		6	8	10	13	16	20	25	30	40	50	60	80	100
Major diameter ϕD_0 h7		6	8	10	13	16	20	25	30	40	50	60	80	100
Ball center-to-center diameter ϕdp		7	9.3	11.5	14.8	17.8	22.1	27.6	33.2	44.2	55.2	66.3	87.9	109.5
Type K	Hole diameter (ϕ d_4)	2.5	3	4	5	7	10	12	16	22	25	32	52.5	67.5
	Mass(kg/m)	0.2	0.35	0.52	0.95	1.3	1.8	3	4	6.9	11.6	16	22.6	33.7
Type N	Hole diameter (ϕ d_4)	—	—	—	—	11	14	18	21	29	36	—	—	—
	Mass(kg/m)	—	—	—	—	0.8	1.3	1.9	2.8	4.7	7.4	—	—	—

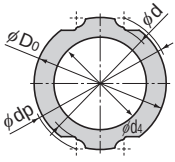
Note) The standard hollow type Spline Shaft is divided into types K and N. Indicate “K” or “N” at the end of the model number to distinguish between them when placing an order.



Type K (Thick)

Table5 Cross-Sectional Shape of the Hollow Spline Shaft for Models LT-X, LF-X, LFK-X, and LFH-X (K Type)　　Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30
Minor diameter ϕ d	—	—	—	—	8.6	11.3	13.9	17.9	22.4	27
Major diameter ϕ D_0	—	—	—	—	10	13	16	20	25	30
Ball center-to-center diameter ϕ dp	—	—	—	—	10.7	13.8	17.1	21.1	26.4	31.6
Hole diameter ϕ d_4	—	—	—	—	4	5	7	10	12	16
Mass (g/m)	—	—	—	—	490	850	1220	1790	2820	3780



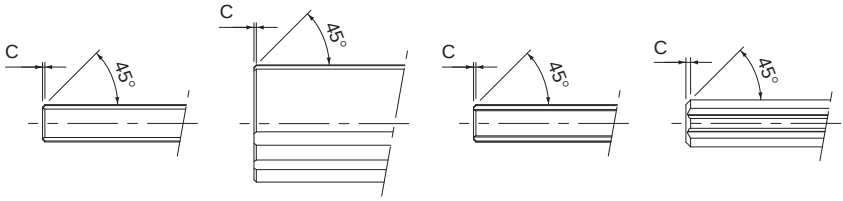
Type N (Thin)

Table6 Cross-Sectional Shape of the Hollow Spline Shaft for Models LT-X, LF-X, LFK-X, and LFH-X (N Type)　　Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30
Minor diameter ϕ d	—	—	—	—	—	—	13.9	17.9	22.4	27
Major diameter ϕ D_0	—	—	—	—	—	—	16	20	25	30
Ball center-to-center diameter ϕ dp	—	—	—	—	—	—	17.1	21.1	26.4	31.6
Hole diameter ϕ d_4	—	—	—	—	—	—	11	14	18	21
Mass (g/m)	—	—	—	—	—	—	770	1190	1700	2630

[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.



LT/LF4 to 13 | LT/LF16 to 100 | LT/LF4X to 8X | LT/LF10X to 30X

Table 7 Chamfer Dimensions of Model LT and Model LF Spline Shaft Ends

Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30	32	40	50	60	80	100
Chamfer C	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	2.0	2.0	2.0

Table 8 Chamfer Dimensions of Models LT-X, LF-X, LFK-X, and LFH-X Spline Shaft Ends

Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30
Chamfer C	0.3	0.3	0.5	0.5	1.5	1.5	1.5	1.5	2.0	2.0

[Length of the Incomplete Area of a Special Spline Shaft]

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (ϕd), an imperfect spline area is required to secure a recess for grinding. Table9 shows the relationship between the length of the incomplete section (S) and the flange diameter (ϕdf).
(This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.)

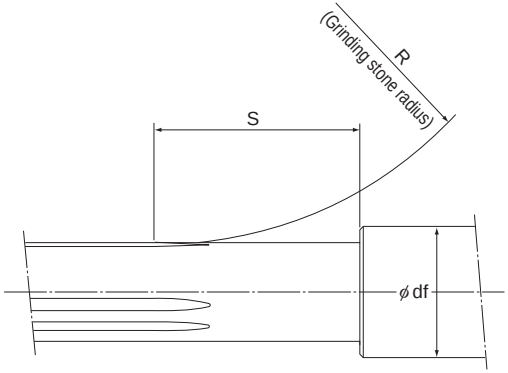


Table9 Length of Imperfect Spline Area: S Miniature type

Unit: mm

Flange diameter ϕdf / Nominal shaft diameter	4	5	6	8	10
4	23	25	27	31	—
5	—	24	26	29	33

Standard Type

Unit: mm

Flange diameter ϕdf / Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100	120	140	160
6	24	28	31	39	—	—	—	—	—	—	—	—	—	—	—	—
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	—	—	—	—	—	—
30	—	—	—	—	—	—	—	40	62	80	95	—	—	—	—	—
40	—	—	—	—	—	—	—	—	42	63	81	107	—	—	—	—
50	—	—	—	—	—	—	—	—	—	45	65	96	118	—	—	—
60	—	—	—	—	—	—	—	—	—	—	50	87	114	134	—	—
80	—	—	—	—	—	—	—	—	—	—	—	53	89	115	135	—
100	—	—	—	—	—	—	—	—	—	—	—	—	57	90	116	136

*This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.

Compact Type

Unit: mm

Flange diameter ϕ df / Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30	35	40	50	60
4X	23	25	27	31	—	—	—	—	—	—	—	—	—	—
5X	—	24	26	29	33	—	—	—	—	—	—	—	—	—
6X	—	—	24	28	31	39	—	—	—	—	—	—	—	—
8X	—	—	—	25	29	35	41	—	—	—	—	—	—	—
10X	—	—	—	—	26	40	48	56	—	—	—	—	—	—
13X	—	—	—	—	—	33	41	51	61	—	—	—	—	—
16X	—	—	—	—	—	—	36	47	58	67	—	—	—	—
20X	—	—	—	—	—	—	—	37	50	60	67	76	—	—
25X	—	—	—	—	—	—	—	—	38	51	59	72	88	—
30X	—	—	—	—	—	—	—	—	—	40	50	62	80	95

Accessories

Ball Spline model LT is provided with a standard key as indicated in Table10.

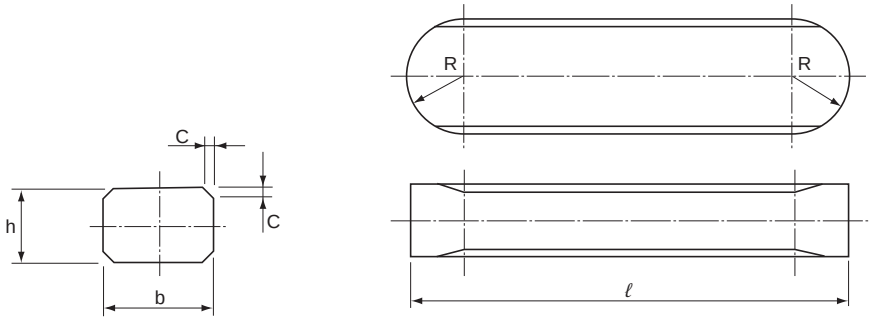


Table10 Standard Key for Model LT

Unit: mm

Nominal shaft diameter	Width b		Height h		Length ℓ		R	C
		Tolerance(p7)		Tolerance(h9)		Tolerance(h12)		
LT 4	2	+0.016 +0.006	2	0 −0.025	6	0 −0.120	1	0.3
LT 5	2.5		2.5		8	0 −0.150	1.25	0.5
LT 5X	2		2		4.7	0 −0.120	1	0.2
LT 5XL	2		2		4.7		1	
LT 6	2.5		2.5		10.5	0 −0.180	1.25	0.5
LT 6X	2		2		6	0 −0.120	1	0.3
LT 6XL	2		2		6		1	
LT 8	2.5		2.5		10.5	0 −0.180	1.25	0.5
LT 8X	2.5		2.5		8	0 −0.150	1.25	
LT 8XL	2.5		2.5		8		1.25	
LT 10	3		3		13	0 −0.180	1.5	
LT 10X	3		3		13		1.5	
LT 13	3		3		15		1.5	
LT 13X	3		3		15		1.5	
LT 16	3.5	+0.024 +0.012	3.5	0 −0.030	17.5		1.75	
LT 16X	3.5		3.5		17.5		1.75	
LT 20	4		4		29	0 −0.210	2	
LT 20X	4		4		29		2	
LT 25	4		4		36	0 −0.250	2	
LT 25X	4		4		36		2	
LT 30	4		4		42		2	
LT 30X	4		4		42		2	
LT 40	6		6		52	0 −0.300	3	
LT 50	8	+0.030 +0.015	7	0 −0.036	58		4	
LT 60	12	+0.036 +0.018	8		67		6	0.8
LT 80	16		10		76		8	
LT 100	20	+0.043 +0.022	13	0 −0.043	110	0 −0.350	10	