6.3. Service Conditions and Selection of a Preload

Table 1 provides guidelines for selecting a clearance in the rotational direction with given service conditions of the Ball Spline.
The rotational clearance of the Ball Spline significantly affects the accuracy and rigidity of the spline nut.
Therefore, it is essential to select a correct clearance according to the intended use. Generally, the Ball Spline is preloaded during operation. When it is used in repeated circular motion or reciprocating linear motion, the Ball Spline is subject to a large vibration impact, and therefore, its service life and accuracy are significantly increased with a preload.

Table 1 Guidelines for Selecting a Clearance in the Rotational Direction for the Ball Spline

		Service conditions	Example of application
Clearance in rotational direction	CM	●High rigidity is required and vibration impact is present. ●Receives a moment load with a single spline nut.	Steering shaft of construction vehicle; shaft of spot-welding machine; indexing shaft of automatic lathe tool rest
	CL	●An overhang load or moment is present. ●High positioning accuracy is required. ●Alternating load is applied.	Industrial robot arm; automatic loaders; guide shaft of automatic coating machine; main shaft of electric discharge machine; guide shaft for press die setting; main shaft of drilling machine
	Normal	●Smooth motion with a small force is desired. ●A torque is always applied in the same direction.	Measuring instruments; automatic drafting machine; geometrical measuring equipment; dynamometer; wire winder; automatic welding machine; main shaft of horning machine; automatic packing machine

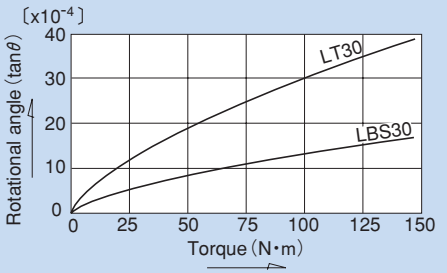

Fig. 3 Comparison between LBS and LT for Zero Clearance

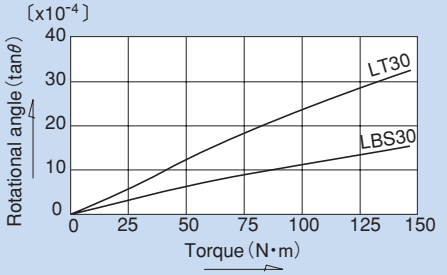

Fig. 4 Comparison between LBS and LT for Clearance CL

Table 2 Clearance in the Rotational Direction for Models LBS, LBF, LBST, LBR and LBH Unit: μm

Symbol / Nominal shaft diameter	Normal	Light preload	Medium preload
	No symbol	CL	CM
6 8	− 2 to +1	− 6 to − 2	
10 15	− 3 to +2	− 9 to − 3	−15 to − 9
20 25 30	− 4 to +2	−12 to − 4	−20 to −12
40 50 60	− 6 to +3	−18 to − 6	−30 to −18
70 85	− 8 to +4	−24 to − 8	−40 to −24
100 120	−10 to +5	−30 to −10	−50 to −30
150	−15 to +7	−40 to −15	−70 to −40

Table 3 Clearance in the Rotational Direction for Models LT and LF Unit: μm

Symbol / Nominal shaft diameter	Normal	Light preload	Medium preload
	No symbol	CL	CM
4 5 6 8 10 13	− 2 to +1	− 6 to − 2	
16 20	− 2 to +1	− 6 to − 2	− 9 to − 5
25 30	− 3 to +2	−10 to − 4	−14 to − 8
40 50	− 4 to +2	−16 to − 8	−22 to −14
60 80	− 5 to +2	−22 to −12	−30 to −20
100	− 6 to +3	−26 to −14	−36 to −24

Table 4 Clearance in the Rotational Direction for Models LBG and LBGT Unit: μm

Symbol / Nominal shaft diameter	Normal	Light preload	Medium preload
	No symbol	CL	CM
20 25 30	− 4 to +2	−12 to − 4	−20 to −12
40 50 60	− 6 to +3	−18 to − 6	−30 to −18
70 85	− 8 to +4	−24 to − 8	−40 to −24

Table 5 Clearance in the Rotational Direction for Model LTR Unit: μm

Symbol / Nominal shaft diameter	Normal	Light preload	Medium preload
	No symbol	CL	CM
8 10	− 2 to +1	− 6 to − 2	
16 20	− 2 to +1	− 6 to − 2	− 9 to − 5
25 32	− 3 to +2	−10 to − 4	−14 to − 8
40 50	− 4 to +2	−16 to − 8	−22 to −14
60	− 5 to +2	−22 to −12	−30 to −20