2.3. Durability Tests with Link Ball® Model BL

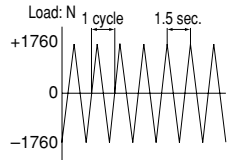
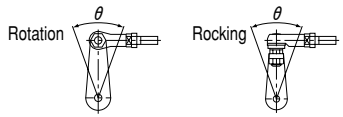
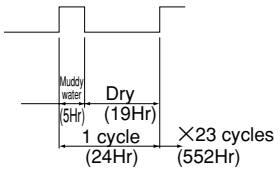
■Purpose of the Tests

The tests were conducted to identify the performance difference between THK Link Ball model BL and an equivalent product of a competitor. As a result, model BL has been used in joints for transmission control units of automobiles, trucks and buses and for steering mechanisms of agricultural tractors.

■Comprehensive Evaluation

As a result of comparing THK Link Ball model BL10D and a competitor's product in representative durability tests, it is demonstrated that model BL10D is superior in strength and wear resistance of the holder and sealability of the boot.
These features are achieved through THK 's unique manufacturing process for the holder and the shank, the material used, the structure of upper and lower grease pockets on the spherical area and the development of a highly sealable boot.

■Tested Product, Test Items, Test Conditions and Test Results

Test item	Tested model No.	Test conditions: Applied load	Rotation or rocking angle	Frequency	Total number of revolutions or time	Atmosphere	Load conditions, etc.	Test result:	Sample No.	Change in clearance (μm) Perpendicular to the axis	Change in clearance (μm) Axial direction	Conditions of the holder, etc.	Evaluation
Rotation-and-rocking durability	Comparison of THK Link Ball model BL10D and competitor's product	±1760 N (load direction: perpendicular to the axis)	Rotation angle: θ=±20° Rocking angle: α=±20°	40 times/min.	1 million cycles	Normal temperature	The loading diagram is as follows.  The motion direction is as follows: 	THK model BL10D	①	26	42	The shank was capable of smoothly rotating after the 1-million cycle test, and capable of continuously operating.	●Even in complex link motion, THK model BL10D demonstrated higher durability and wear resistance of the holder than competitor's product.
									②	25	40		
								Competitor's product	①	Broke in the holder neck after 8,600 cycles 154	60	Wear and damage were observed in the holder's spherical area in approx. 150,000-cycle operation.	●The abrasion loss of the competitor's product immediately before the breakage of the holder was 6 times greater than THK model BL10D (perpendicular to the axis).
									②	Broke in the holder neck after 151,300 cycles 62	20		
Low-temperature rotation durability	THK Link Ball model BL10D only	±1225 N (load direction: perpendicular to the axis)	Rotation angle: θ=±30°	60 times/min.		−30℃	Low-temperature retention time: 280 hours Motion in the rotational direction	THK model BL10D	①	63	65	The boot did not show a crack or the like at low temperature	●This indicates that THK model BL10D is sufficiently capable of operating in outdoor applications in cold climates.
									②	56	59		
High-temperature rotation durability						100℃	High-temperature retention time: 280 hours Motion in the rotational direction		①	79	84	The holder did not show abnormal wear and the boot did not show thermal deterioration at high temperature.	●This indicates that THK model BL10D is sufficiently capable of operating in hot areas of a truck engine.
									②	74	78		
Muddy-water rotation durability						Normal temperature	Motion: rotational direction and rocking on a separate basis Muddy water discharge pattern Muddy water concentration: 5 Wt% of salt and dust each in 1 liter of water Discharge direction: against the boot lip Discharge pressure: 5 kg/cm² 		①	48	51	No muddy-water penetration that may cause wear was observed.	●This indicates that THK model BL10D is sufficiently capable of operating in environments subject to muddy water such as trucks, construction vehicles and agricultural machines since the sealing effect of the boot prevents penetration of muddy water.
									②	57	63		
									①	32	38		
									②	35	42		
Muddy-water rocking durability	Comparison of THK Link Ball model BL10D and competitor's product		Rocking angle: α=±20°					Competitor's product	①	240	105	Muddy water penetrated the boot, the spherical area showed chipping and the boot had cuts.	●The competitor's product cannot be used in environments subject to muddy water since chipping or the like may occur in such environments. In addition, wear of the spherical area reached 0.24 mm, 7.4 times greater than THK model BL10D.
									②	246	107		