

Precision Ball Splines for Compact Motion Systems

Selection Guide — micro to large bore · standard and custom



Ø3 mm

Super-precision micro ball spline — one of only two makers worldwide in volume production

400M

Cycles proven on an SMT mounter endurance rig (vertical shaft, 860 mm/s, 10 G, 15 mm stroke)

7–14 days

Dispatch for orders under 10 sets · MOQ 1 set · non-standard customization supported

Ø2–Ø100

Shaft diameter range in mm · JIS-class accuracy · free-combination system

Built for high-beat high-precision machines

The UVT ball spline is a linear motion guide in which the outer cylinder travels along the spline shaft. Steel balls roll in the spline grooves, so it carries radial loads **and** rotational torque — the core motion component of SMT placement machines, dispensers and semiconductor packaging equipment.

Φ3 mm

World's smallest class in volume production — one of only two makers worldwide (the other is in Japan)

HRC 60±2

Raceway surface hardness after heat treatment; load capacity about 30 % higher than comparable products

P class

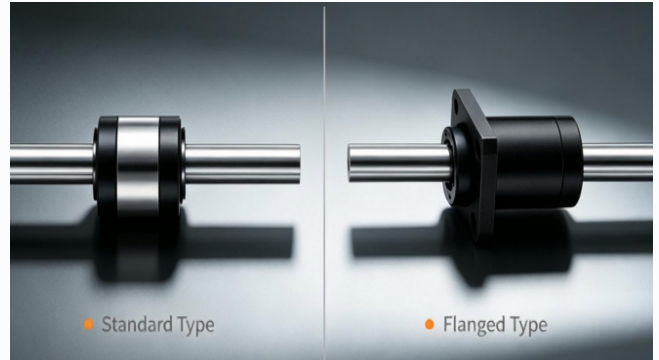
Accuracy up to JIS class P; accuracy grades and preload types freely combined (UVT free-combination system)

1 set

Minimum order quantity — prototypes and small lots supported, non-standard parts welcome

Why four-point contact matters

- ▶ **Compact and rigid** — steel balls contact each raceway at four points: balanced capacity in any load direction.
- ▶ **Accurate rotation positioning** — preloading removes rotational backlash, no rotational deviation.
- ▶ **Smooth, low-friction travel** — optimally designed ball retainer for high-speed reciprocation.

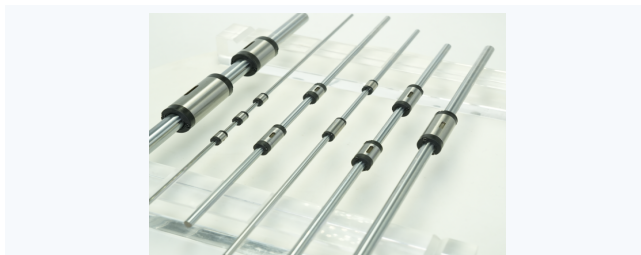


3D model of the UVT super-precision ball spline (from UVT engineering CAD data).



Φ3 mm micro ball spline (actual product photo). Shaft diameters from Ø2 to Ø100 mm.

6 families, one source



UVT / UVTF — Standard & Flange

Ø3–50 mm · solid / hollow / extended shafts. The super-precision flagship family for SMT and semiconductor axes.



ULT / ULF — 4-Groove Cylindrical & Round Flange

Ø4–100 mm · four ball grooves for higher load capacity and rigidity in general automation.



USLT / USLF / USPT — Light Series

Ø6–50 mm · compact cylindrical, round-flange and trimmed-flange types for space-critical builds.



ULTR A / B — Rotary Series

Ø8–60 mm · combined rotation and linear travel in one unit; light (A) and heavy-duty (B) frames.



UBNS / UNS — Ball Screw Spline

Ø16 / 20 / 25 / 32 mm · ball screw + ball spline on one shaft: linear feed, rotation and positioning combined.



US — Limited Stroke

Ø4–6 mm · reciprocating motion in a fixed stroke — SMT nozzles and precision limited-stroke units.

Every family shares the same selection logic: **pick the family by motion & mounting** → **pick the size by ratings** → **confirm the mounting envelope with the dimension table** → **send the model (or your current brand's model) for a quote.**

From machine requirement to UVT modelnumber

Four-step selection

- 1

Define the motion. Linear travel and stroke, torque to be transmitted, mounting space, environment (cleanroom, dust, temperature).
- 2

Pick the family. Standard 2-groove (UVT/UVTF) · high-load 4-groove (ULT/ULF) · light & compact (USLT/USLF/USPT) · rotary + linear (ULTR) · screw + spline (UBNS/UNS) · limited stroke (US).
- 3

Check the numbers. Use the series dimension/rating tables in this guide: basic load ratings C / C₀, torque ratings T / T₀, mounting dimensions and tolerances.
- 4

Send it over. Send the UVT model — or your current brand and model for an equivalent-selection check — and request a quote. CAD (STEP / 2D PDF) is available for every series.

Already using THK / NB / IKO / NSK? Go straight to the Equivalent Selection section (p. 15): send the current model and mounting dimensions, and UVT engineering will check a potential alternative for you.

Requirement → family quick map

Your requirement	Family
Torque + linear in micro space, highest precision	UVT / UVTF
Higher load capacity and rigidity	ULT / ULF
Light and compact axis	USLT / USLF / USPT
Rotate while travelling	ULTR A / B
Feed and rotation on one shaft	UBNS / UNS
Fixed-stroke reciprocation (nozzle shafts)	US

Reading the model number

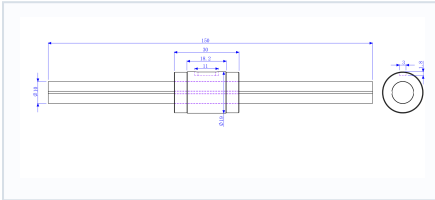
Model number designation ①–④

① Type	UVT	Standard type
② Outer-cylinder length	No mark	Standard
	L	High-rigidity extended
③ Spline-shaft shape	No mark	Solid shaft
	A	Hollow shaft
④ Size	3 4 5 6 8	

Example: **UVT L A 5 C2 R150 T1 H S1 /N** — high-rigidity extended outer cylinder, hollow Ø5 spline shaft, set of two cylinders, 150 mm shaft, light preload, H accuracy grade (see each series page for its own designation table). The same size can be ordered in different accuracy grades and preload types with an identical mounting envelope — UVT’s free-combination system.

UVT — Super Precision Standard Series

UVT PRECISION BALL SPLINE



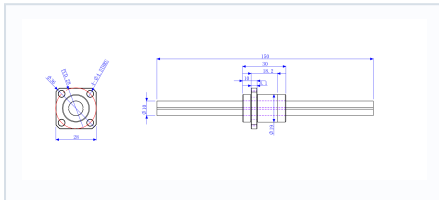
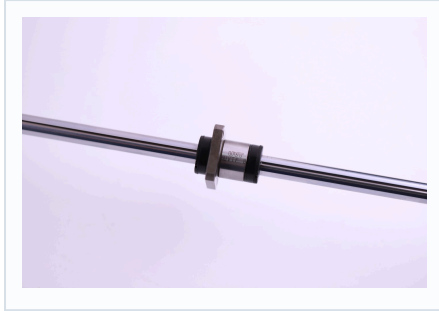
Real 2D engineering drawing — UVT10C1R150 (example size). Units: mm.

The flagship super-precision series. Two ball grooves in four-point contact carry radial load and torque simultaneously; models from $\Phi 3$ mm — one of only two such products in volume production worldwide — up to $\Phi 50$ mm, with solid, hollow and extended spline shafts.

3–50 mm Shaft Ø				2 Grooves		1880 N C on Ø10				std / hollow / long Types												
Model No. UVT series	Free combination	Mass (reference) g		Outer-cylinder dimensions & tolerances mm								Spline-shaft dimensions & tolerances mm				Basic dynamic load rating ⁽⁴⁾ C N	Basic static load rating ⁽⁴⁾ C ₀ N	Dynamic torque rating ⁽⁴⁾ T N·m	Static torque rating ⁽⁴⁾ T ₀ N·m	Static moment rating ⁽⁴⁾ N·m		
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L ₁	L ₂	W	W tolerance	t	ℓ	d	d tolerance	d ₁ ⁽²⁾	d ₂					(L) max length	T _X	T _Y
UVT 3 ⁽¹⁾	–	2.1	5.4	7	0 –0.009	10	5.9	–	–	0.8	–	3	0 –0.010	2.2	–	150	251	285	0.45	0.51	0.31 1.9	0.53 3.3
UVT 4 ⁽¹⁾	–	2.5	9.6	8	0 –0.009	12	7.9	–	–	1	–	4	0 –0.012	3.2	1.5	200	303	380	0.70	0.87	0.52 2.9	0.90 5.0
UVTL 4 ⁽¹⁾	–					15	10.9														0.52 3.8	0.90 6.5
UVTXL 4 ⁽¹⁾	–					21	16.9														1.50 8.60	2.60 15.0
UVT 5	○	4.8	14.9	10	0 –0.009	18	9.2	2	+0.014 0	1.2	6	5	0 –0.012	4.2	2	200	587	641	1.8	1.9	1.0 7.9	1.8 13.6
UVTL 5	○	8.1				26	17.2										879	1180	2.6	3.5	3.2 19.3	5.5 33.4
UVT 6	○	8.9	19	12	0 –0.011	21	12.4	2	+0.014 0	1.2	8	6	0 –0.012	5.2	2	300	711	855	2.5	3.0	1.7 11.7	3.0 20.3
UVTL 6	○	14.5				30	21.4										1030	1500	3.6	5.2	5.0 27.6	8.6 47.8
UVT 8	○	15.9	39	15	0 –0.011	25	14.6	2.5	+0.014 0	1.5	8.5	8	0 –0.015	7	3	500	1190	1330	5.5	6.2	3.3 22.0	5.6 38.1
UVTL 8	○	26.5				37	26.6									1800	2470	8.4	11.5	10.3 56.3	17.8 97.5	
UVT 10	○	31.5	60.5	19	0 –0.013	30	18.2	3	0 –0.014	1.8	11	10	0 –0.015	8.9	4	600	1880	2150	10.9	12.5	7.0 41.5	12.1 71.9

Model No. UVT series	Free combination	Mass (reference) g		Outer-cylinder dimensions & tolerances mm										Spline-shaft dimensions & tolerances mm				Basic dynamic load rating ⁽⁴⁾ C N	Basic static load rating ⁽⁴⁾ C ₀ N	Dynamic torque rating ⁽⁴⁾ T N·m	Static torque rating ⁽⁴⁾ T ₀ N·m	Static moment rating ⁽⁴⁾ N·m	
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L ₁	L ₂	W	W tolerance	t	ℓ	d	d tolerance	d ₁ ⁽²⁾	d ₂	(L) max length	T _x					T _y	
UVTL 10	○	56.5	47	34.9	2850	4040	16.6	23.4	22.7 115	39.3 200													
UVT 12	○	44	87.5	21	0 −0.013	35	23	3	0 −0.014	1.8	15	12	0 −0.018	10.9	6	800	2180	2690	14.8	18.3	10.6 59.1	18.3 102	
UVTL 12	○	76.8				54	42										3220	4850	21.9	33.0	32.2 157	55.7 272	
UVT 15	○	59.5	111	23	0 −0.013	40	27	3.5	0 −0.018	2	20	13.6	0 −0.018	11.6	−	1000	4180	6070	31.3	45.6	27.8 152	33.2 181	
UVTL 15	○	110				65	52										6400	11500	48.0	86.5	94.0 449	112 535	
UVT 20	○	130	202	30	0 −0.016	50	33	4	0 −0.018	2.5	26	18.2	0 −0.021	15.7	−	1000	6600	9040	66.0	90.4	48.6 288	58.0 343	
UVTL 20	○	198				71	54										9270	15100	92.7	151	127 650	151 774	
UVT 25	○	220	310	37	0 −0.016	60	39.2	5	0 −0.018	3	29	22.6	0 −0.021	19.4	−	1200	11200	14300	139	178	92.8 551	111 656	
UVTL 25	○	336				84	63.2										15400	23200	193	290	229 1190	273 1420	
UVT 30	○	430	450	45	0 −0.016	70	43	7	0 −0.022	4	35	27.2	0 −0.021	23.5	−	1200	15400	19400	231	292	147 874	176 1040	
UVTL 30	○	634				98	71										21300	31600	320	474	364 1900	434 2260	

UVTF — Flange Type (Super Precision)

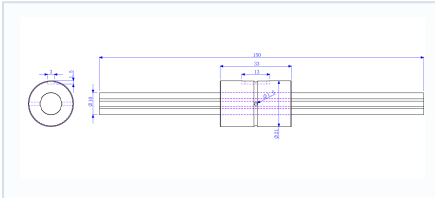
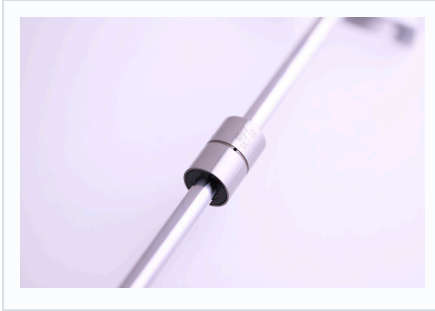


Real 2D engineering drawing — UVTF10C1R150 (example size). Units: mm.

Flanged outer cylinder of the UVT super-precision family: the mounting face carries the load directly, simplifying installation on tool plates and Z-axes. Standard, hollow-shaft, extended and extended-hollow variants share the same envelope logic.

3–40 mm Shaft Ø				2 Grooves			flange Mounting			std / hollow / long Types																
Model No. UVTF series	Free combination	Mass (reference) g	Outer-cylinder dimensions & tolerances mm														Spline-shaft dimensions & tolerances mm				C N	C ₀ N	T N·m	T ₀ N·m	T _X N·m	T _Y N·m
			Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L ₁	L ₂	D ₁	B	E	T	pcd	d ₃	d	d tolerance	d ₁ (*)	d ₂	(L) max length							
UVTF 3 ⁽¹⁾	–	3.7	5.4	7	0–0.009	10	5.9	18	9	4	1.9	13	2.9	3	0–0.010	2.2	–	150	251	285	0.45	0.51	0.311.9	0.533.3		
UVTF 4 ⁽¹⁾	–	5.1	9.6	8	0–0.009	12	7.9	20	10	4.6	2.5	15	3.4	4	0–0.012	3.2	1.5	200	303	380	0.70	0.87	0.522.9	0.905.0		
UVTF 5	○	8.9	14.9	10	0–0.009	18	9.2	23	18	7	2.7	17	3.4	5	0–0.012	4.2	2	200	587	641	1.8	1.9	1.07.9	1.813.6		
UVTF L5	○	12				26	17.2												879	1180	2.6	3.5	3.219.3	5.533.4		
UVTF 6	○	13.9	19	12	0–0.011	21	12.4	25	20	7	2.7	19	3.4	6	0–0.012	5.2	2	300	711	855	2.5	3.0	1.711.7	3.020.3		
UVTF L6	○	19.5				30	21.4												1030	1500	3.6	5.2	5.027.6	8.647.8		
UVTF 8	○	23.5	39	15	0–0.011	25	14.6	28	22	9	3.8	22	3.4	8	0–0.015	7	3	500	1190	1330	5.5	6.2	3.322.0	5.638.1		
UVTF L8	○	34.1				37	26.6												1800	2470	8.4	11.5	10.356.3	17.897.5		
UVTF 10	–	45	60.5	19	0–0.013	30	18.2	36	28	10	4	28	4.5	10	0–0.015	8.9	4	600	1880	2150	10.9	12.5	7.041.5	12.171.9		
UVTF L10	○	70.1				47	34.9												2850	4040	16.6	23.4	22.7115	39.3200		
UVTF 12	○	59	87.5	21	0–0.013	35	23	38	30	10	4.1	30	4.5	12	0–0.018	10.9	6	800	2180	2690	14.8	18.3	10.659.1	18.3102		
UVTF L12	○	91.8				54	42												3220	4850	21.9	33.0	32.2157	55.7272		
UVTF 15	○	77	111	23	0–0.013	40	27	40	31	11	4.5	32	4.5	13.6	0–0.018	11.6	–	1000	4180	6070	31.3	45.6	27.8152	33.2181		
UVTF L15	○	128				65	52												6400	11500	48.0	86.5	94.0449	112535		
UVTF 20	○	150	202	30	0–0.016	50	33	46	35	14	5.5	38	4.5	18.2	0–0.021	15.7	–	1000	6600	9040	66.0	90.4	48.6288	58.0343		
UVTF L20	○	218				71	54												9270	15100	92.7	151	127650	151774		
UVTF 25	○	255	310	37	0–0.016	60	39.2	57	43	17	6.6	47	5.5	22.6	0–0.021	19.4	–	1200	11200	14300	139	178	92.8551	111656		
UVTF L25	○	371				84	63.2												15400	23200	193	290	2291190	2731420		
UVTF 30	○	476	450	45	0–0.016	70	43	65	50	21	7.5	54	6.6	27.2	0–0.021	23.5	–	1200	15400	19400	231	292	147874	1761040		
UVTF L30	○	680				98	71												21300	31600	320	474	3641900	4342260		

ULT — 4-Groove Cylindrical Type



Real 2D engineering drawing — UVT10C1R150 (example size). Units: mm.

Four ball grooves double the load-carrying points: higher load capacity and rigidity for general automation axes. The widest size span of the UVT line — Ø4 up to Ø100 mm.* * Max. shaft length per size; see table column (L).

4–100 mm Shaft Ø

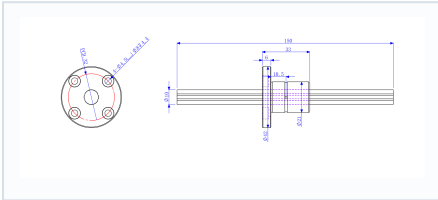
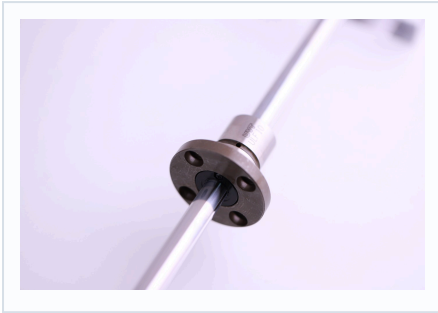
4 Grooves

higher Load

up to 6000 mm* Length

Model No. ULT series	Number of ball rows	Mass (reference) g		Outer-cylinder dimensions & tolerances mm								Spline-shaft dimensions & tolerances mm			Basic dynamic load rating C N	Basic static load rating C ₀ N	Dynamic torque rating T N·m	Static torque rating T ₀ N·m	Static moment rating N·m	
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L	W	W tolerance	t	e	Oil hole d ₀	d	d tolerance	d ₂					T _x	T _y
ULT 4	4	4.7	10.0	10	0 −0.009	16	2	+0.014 0	1.2	6	—	4	0 −0.012	1.5	860	1220	0.74	1.05	1.97	10.3
ULT 5	4	9.1	15.0	12	0 −0.011	20	2.5	+0.014 0	1.2	8	—	5	0 −0.012	2.0	1075	1525	0.93	1.31	2.46	12.8 8
ULT 6	4	19.0	21.0	14	0 −0.011	25	2.5	+0.014 0	1.2	10.5	1	6	0 −0.012	2.0	1220	2280	1.5	2.4	5.1	40
ULT 8	4	23.0	38.0	16	0 −0.011	25	2.5	+0.014 0	1.2	10.5	1.5	8	0 −0.015	3.0	1450	2870	2.1	3.7	7.4	50
ULT 10	4	54.0	60.0	21	0 −0.013	33	3	+0.014 0	1.5	13	1.5	10	0 −0.015	4.0	2670	4890	4.4	8.20	13.7	109
ULT 13	4	70.0	100.0	24	0 −0.013	36	3	+0.014 0	1.5	15	1.5	13	0 −0.018	7.0	2730	5070 0	21	39.2	18	116
ULT 16	4	150.0	150.0	31	0 −0.013	50	3.5	+0.018 0	2	17.5	2	16	0 −0.018	8.0	6120	1120 0	60	110.0	46	299
ULT 20	4	220.0	238.0	35	0 −0.016	63	4	+0.018 0	2.5	29	2	20	0 −0.021	10.0	8900	1630 0	105	194.0	110	560
ULT 25	4	330.0	370.0	42	0 −0.016	71	4	+0.018 0	2.5	36	3	25	0 −0.021	15.0	1280 0	2320 0	189	346.0	171	1020
ULT 30	4	360.0	536.0	47	0 −0.016	80	4	+0.022 0	2.5	42	3	30	0 −0.021	17.0	1860 0	2340 0	307	439.0	181	1470
ULT 40	4	950.0	955.0	64	0 −0.019	100	6	+0.022 0	3.5	52	4	40	0 −0.025	20.0	3080 0	3750 0	674	934.0	358	2940
ULT 50	4	1900.0	1500.0	80	0 −0.019	125	8	+0.027 0	4	58	4	50	0 −0.025	26.0	4030 0	6490 0	1290	2950.0	690	4080
ULT 60	4	2300.0	2160.0	90	0 −0.022	140	12	+0.032 0	5	67	5	60	0 −0.03	—	4770 0	7950 0	1570	3420.0	881	5470
ULT 80	4	6400.0	3900.0	120	0 −0.022	160	16	+0.04 0	6	76	5	80	0 −0.03	—	9280 0	10800 0	4500	6460.0	1990	10500
ULT 100	4	11200.0	6100.0	150	0 −0.025	185	20	+0.05 0	7	110	5	100	0 −0.035	—	15100 0	16000 0	9180	12000.0	3350	18200

ULF — 4-Groove Round-Flange Type



Real 2D engineering drawing — ULF10C1R150 (example size). Units: mm.

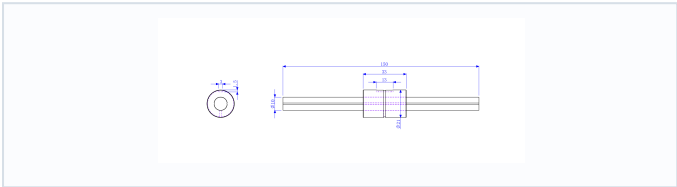
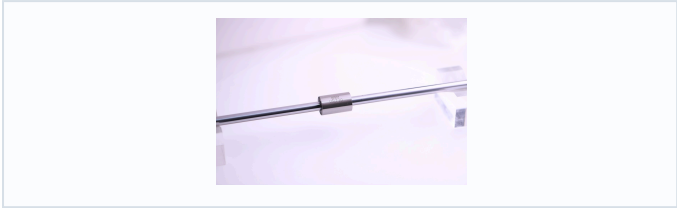
Round-flange version of the 4-groove family — the flange bolts directly onto the mating plate, ideal for robot arms and Z-axes where a through-hole mounting face is available.

6–50 mm Shaft Ø				4 Grooves		round flange Mounting				through H7 Bolts													
Model No. ULF series	Number of ball rows	Mass (reference) g		Outer-cylinder dimensions & tolerances mm										Spline-shaft dimensions & tolerances mm			Basic dynamic load rating C _N	Basic static load rating C ₀ N	Dynamic torque rating T ₀ N·m	Static torque rating T ₀ N·m	Static moment rating N·m		
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L	L tolerance	D ₁	D ₁ tolerance	H	F	Oil hole d ₀	PC D	Mounting hole d ₁ × d ₂ × h	d	d tolerance					d ₃	T _X	T _{X-2}
ULF 6	4	37.0	21.0	14	0 –0.011	25	0 –0.2	30	0 –0.2	5	7.5	1.5	22	3.4×6.5×3.3	6	0 –0.012	2	122 0	228 0	1.5	2.4	5.1	40
ULF 8	4	42.0	38.0	16	0 –0.011	25	0 –0.2	32	0 –0.2	5	7.5	1.5	24	3.4×6.5×3.3	8	0 –0.015	3	145 0	287 0	2.1	3.7	7.4	50
ULF 10	4	94.0	60.0	21	0 –0.013	33	0 –0.2	42	0 –0.2	6	10.5	1.5	32	4.5×8×4.4	10	0 –0.015	4	267 0	489 0	4.4	8.20	13.7	109
ULF 13	4	100.0	100.0	24	0 –0.013	36	0 –0.2	44	0 –0.2	7	11	1.5	33	4.5×8×4.4	13	0 –0.018	7	273 0	507 00	21	39.2	18	116
ULF 16	4	200.0	150.0	31	0 –0.013	50	0 –0.2	51	0 –0.2	7	18	2	40	4.5×8×4.4	16	0 –0.018	8	612 0	112 00	60	110.0	46	299
ULF 20	4	330.0	238.0	35	0 –0.016	63	0 –0.3	58	0 –0.2	9	22.5	2	45	5.5×9.5×5.4	20	0 –0.021	10	890 0	163 00	105	194.0	110	560
ULF 25	4	450.0	370.0	42	0 –0.016	71	0 –0.3	65	0 –0.2	9	26.5	3	52	5.5×9.5×5.4	25	0 –0.021	15	128 00	232 00	189	346.0	171	102 0
ULF 30	4	550.0	536.0	47	0 –0.016	80	0 –0.3	75	0 –0.2	10	30	3	60	6.6×11×6.5	30	0 –0.021	17	186 00	234 00	307	439.0	181	147 0
ULF 40	4	1410.0	955.0	64	0 –0.019	100	0 –0.3	100	0 –0.2	14	36	4	82	9×14×8.6	40	0 –0.025	20	308 00	375 00	674	934.0	358	294 0
ULF 50	4	2730.0	1500.0	80	0 –0.019	125	0 –0.3	124	0 –0.2	16	46.5	4	102	11×17.5×11	50	0 –0.025	26	403 00	649 00	129 0	295 0.0	690	408 0
ULF 60	4	3200.0	2160.0	90	0 –0.022	140	0 –0.3	129	0 –0.2	18	52	4	107	11×17.5×11	60	0 –0.03	–	477 00	795 00	157 0	262 0.0	881	547 0

USLT / USLF — Light Cylindrical & Flange

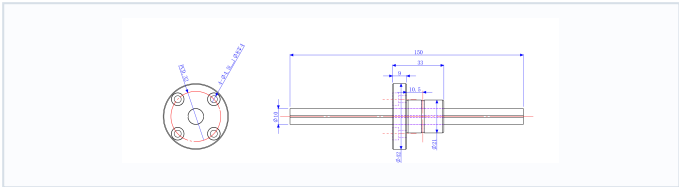
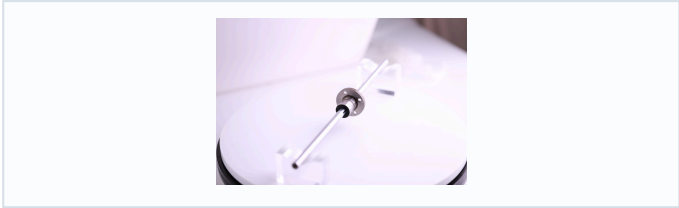
UVT PRECISION BALL SPLINE

USLT — cylindrical type



Real 2D drawing — USLT10C1R150 (example). Units: mm.

USLF — round-flange type



Real 2D drawing — USLF10C1R150 (example). Units: mm.

Light-weight two-groove series for compact, high-speed axes: USLT cylindrical and USLF round-flange, Ø6–20 mm in 2-groove and Ø25–50 mm in 4-groove layouts.

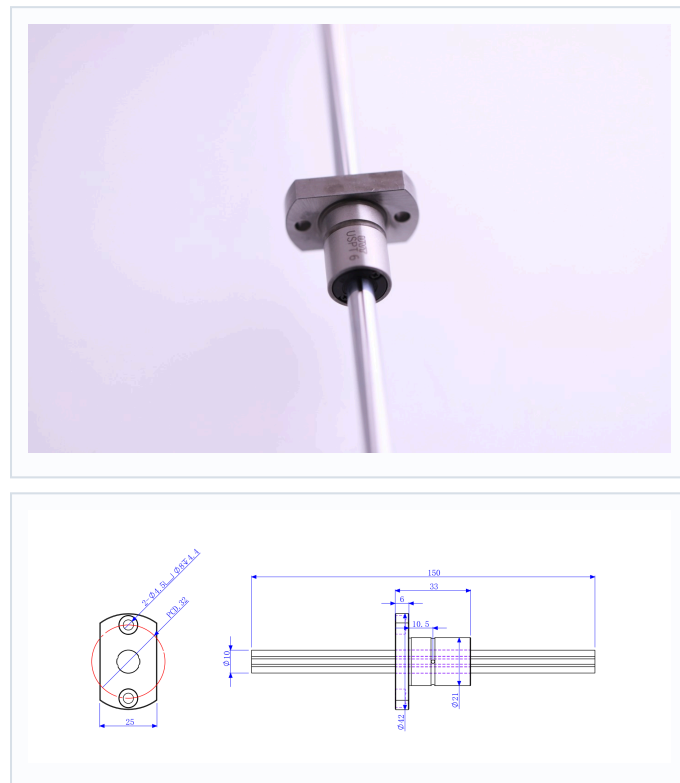
Model No. USLT series	Number of ball rows	Mass (reference) g		Outer-cylinder dimensions & tolerances mm								Spline-shaft dimensions & tolerances mm			Basic dynamic load rating C N	Basic static load rating C ₀ N	Dynamic torque rating T N·m	Static torque rating T ₀ N·m	Static moment rating N·m	
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L	W	W tolerance	t	e	Oil hole d ₀	d	d tolerance	d ₂					T _X	T _{X-2}
USLT 6	2	19.3	22.0	14	0 −0.011	25	2.5	+0.014 0	1.2	10.5	1	6	0 −0.012	2.0	746.55	897.75	0.97	1.56	3.9	34.8
USLT 8	2	23.5	39.0	16	0 −0.011	27	2.5	+0.014 0	1.2	10.5	1.5	8	0 −0.015	3.0	1249.5	1396.5	1.37	2.4	3.46	23.1
USLT 10	2	55.0	62.0	21	0 −0.013	33	3	+0.014 0	1.5	13	1.5	10	0 −0.015	4.0	1974	2257.5	2.86	5.33	7.35	43.57
USLT 13	2	71.6	103.0	24	0 −0.013	36	3	+0.014 0	1.5	15	1.5	13	0 −0.018	7.0	2289	2824.5	15.54	19.215	11.13	62.05
USLT 16	2	152.0	154.0	31	0 −0.013	50	3.5	+0.018 0	2	17.5	2	16	0 −0.018	8.0	4389	6373.5	32.86	47.88	29.19	159.6
USLT 20	2	223.0	244.0	35	0 −0.016	56	4	+0.018 0	2.5	29	2	20	0 −0.021	10.0	6930	9492	69.3	94.92	51.03	302.40
USLT 25	4	330.0	370.0	42	0 −0.016	71	4	+0.018 0	2.5	36	3	25	0 −0.021	15.0	12800	23200	189	346.0	171	1020
USLT 30	4	360.0	536.0	47	0 −0.016	80	4	+0.022 0	2.5	42	3	30	0 −0.021	17.0	18600	23400	307	439.0	181	1470
USLT 40	4	950.0	955.0	64	0 −0.019	100	6	+0.022 0	3.5	52	4	40	0 −0.025	20.0	30800	37500	674	934.0	358	2940
USLT 50	4	1900.0	1500.0	80	0 −0.019	125	8	+0.027 0	4	58	4	50	0 −0.025	26.0	40300	64900	1290	2950.0	690	4080

Model No. USLF series	Number of ball rows	Mass (reference) g		Outer-cylinder dimensions & tolerances mm											Spline-shaft dimensions & tolerances mm			Basic dynamic load rating C N	Basic static load rating C ₀ N	Dynamic torque rating T N·m	Static torque rating T ₀ N·m	Static moment rating N·m	
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L	L tolerance	D ₁	D ₁ tolerance	H	F	Oil hole d ₀	PCD	Mounting hole d ₁ ×d ₂ ×h	d	d tolerance	d ₃					T _X	T _{X-2}
USLF 6	2	19.3	22.0	14	0 −0.011	25	0 −0.2	30	0 −0.2	6	7.5	1	22	3.4×6.5×3.5	6	0 −0.012	2	746.55	897.75	0.97	1.56	3.9	34.8
USLF 8	2	23.5	39.0	16	0 −0.011	27	0 −0.2	32	0 −0.2	8	7.5	1.5	24	3.4×6.5×4.5	8	0 −0.015	3	1249.5	1396.5	1.37	2.4	3.46	23.1
USLF 10	2	55.0	62.0	21	0 −0.013	33	0 −0.2	42	0 −0.2	9	10.5	1.5	32	4.5×8×4.5	10	0 −0.015	4	1974	2257.5	2.86	5.33	7.35	43.57
USLF 13	2	71.6	103.0	24	0 −0.013	36	0 −0.2	44	0 −0.2	9	11	1.5	33	4.5×8×4.5	13	0 −0.018	7	2289	2824.5	15.54	19.215	11.13	62.05
USLF 16	2	152.0	154.0	31	0 −0.013	50	0 −0.2	51	0 −0.2	10	18	2	40	4.5×8×5.4	16	0 −0.018	8	4389	6373.5	32.86	47.88	29.19	159.6
USLF 20	2	223.0	244.0	35	0 −0.016	56	0 −0.3	58	0 −0.2	10	18	2	45	5.5×9.5×5.4	20	0 −0.021	10	6930	9492	69.3	94.92	51.03	302.40
USLF 25	4	330.0	370.0	42	0 −0.016	71	0 −0.3	65	0 −0.2	13	26.5	3	52	5.5×9.5×8	25	0 −0.021	15	12800	23200	189	346.0	171	1020

USPT — Trimmed Flange / US — Limited Stroke

USPT / USPTD — trimmed-flange type

Compact trimmed flange for tight installation envelopes; Ø6–10 mm, 2- and 4-groove variants. Drawing shows USPTD 10 (example).



US — limited-stroke type

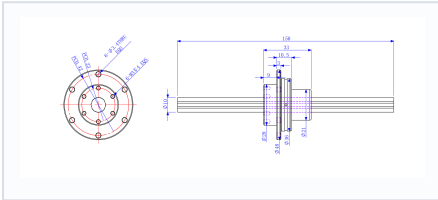
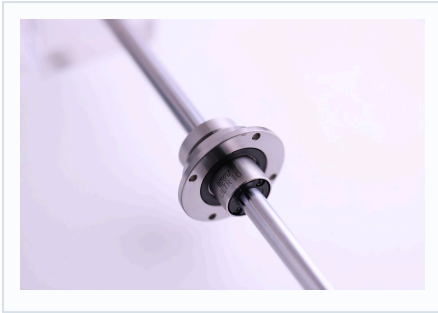
Reciprocating motion inside a fixed stroke — the spline shaft itself is the guide; used on SMT placement nozzles and precision limited-stroke units. Ø4–6 mm.

Model No. US series	Free combination	Mass (reference) g		Outer-cylinder dimensions & tolerances mm						Spline-shaft dimensions & tolerances mm			
		Outer cylinder	Spline shaft (per 100 mm)	D	D tolerance	L ₁	L ₂	M	Max. screw-in depth	d	d tolerance	d ₁ ⁽¹⁾	d ₂
US 4	—	—	9.6	8	0	24	10	M2	1.3	4	0	—	—
USA 4	—	5.7	8.6	8	−0.009	24	10	M2	1.3	4	−0.012	3.2	1.5
US 5	—	—	14.9	10	0	27	12	M2	1.4	5	0	—	—
USA 5	—	8.9	12.4	10	−0.009	27	12	M2	1.4	5	−0.012	4.2	2
US 6	—	—	19	11	0	29	15	M2	1.4	6	0	—	—
USA 6	—	10.9	16.5	11	−0.011	29	15	M2	1.4	6	−0.012	5.2	2

Model No. US series	Spline-shaft length mm		Stroke mm		Max. dimension related to mounting Da mm	Basic dynamic load rating C N	Basic static load rating C ₀ N	Permissible load F N	Dynamic torque rating T N·m	Static torque rating T ₀ N·m	Static moment rating	
	(L) ⁽²⁾	Max. length	Effective stroke length	Max. stroke length							T _x N·m	T _y N·m
US 4	100	200	10	13.2	5	285	380	127	0.66	0.87	0.88	1.5
USA 4	150	150	10	13.2	5	285	380	127	0.66	0.87	0.88	1.5
US 5	100	200	10	14	7	616	748	249	1.8	2.2	2.0	3.5
USA 5	150	150	10	14	7	616	748	249	1.8	2.2	2.0	3.5
US 6	150	300	10	13.6	8	673	855	285	2.4	3.0	2.6	4.4
USA 6	200	200	10	13.6	8	673	855	285	2.4	3.0	2.6	4.4

ULTR A / B — Rotary Series (4-Groove)

UVT PRECISION BALL SPLINE



Real 2D engineering drawing — ULTR10C1R150, light type A (example). Units: mm.



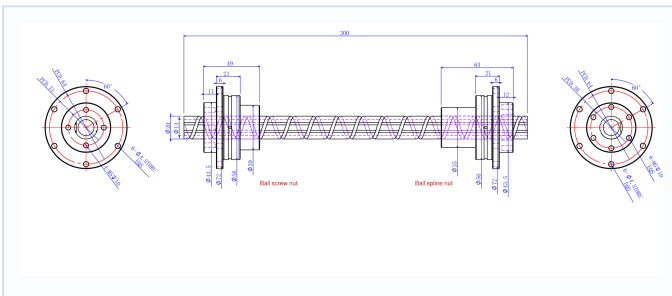
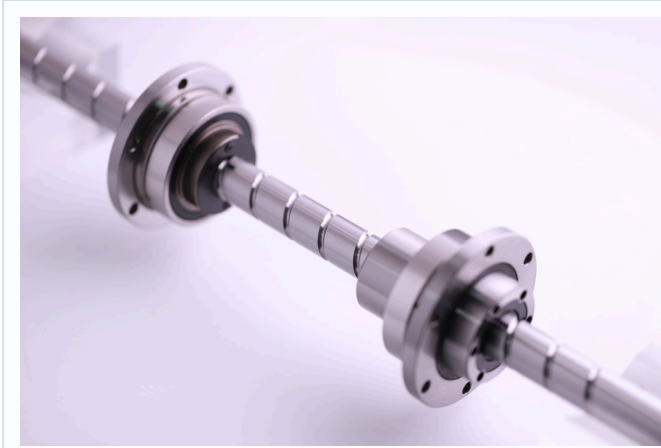
ULTR B heavy type (actual product) — black-chrome plated rear available.

One unit, two motions: the outer cylinder rotates while travelling linearly on the splined shaft — ideal for burnishing, winding, screw-tightening and tool-change units. Frame A (light) covers Ø8–40 mm; frame B (heavy, with Black-chrome rear option) covers Ø16–60 mm. Heavy-type B tables below.

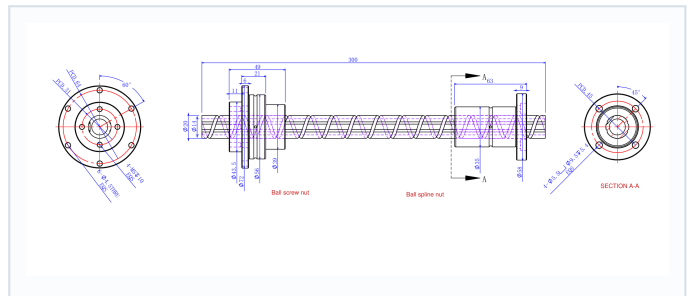
8–60 mm Shaft Ø		4 Grooves		A light / B heavy Frames				rotate + linear Motion							
Model No. ULTR A series	No. of ball rows	Mass (reference) (g)		Outer-cylinder dimensions and tolerances (mm)											
		Outer cylind-er	Spline shaft (per 100 mm)	D	Size tolera-nce	L	D ₁	D ₆ h7	D ₂	H	L ₁	E	E F (K type)	Oil-hole posi-tion	E ₁
ULTR 8	4 rows	80	38.0	32	0 –0.025	25	44	24	16	3	10.5	6	8.5	4	3
ULTR 10	4 rows	130	60.0	36	0 –0.025	33	48	28	21	3	10.5	9	11.5	4	–
ULTR 13	4 rows	190	100.0	44	0 –0.025	36	56	30	24	4	18	9	9	9	–
ULTR 16	4 rows	350	150.0	48	0 –0.025	50	64	36	31	6	21	10	10	10.5	–
ULTR 20	4 rows	510	238.0	56	0 –0.029	63	72	43.5	35	6	21	12	12	10.5	–
ULTR 25	4 rows	790	370.0	66	0 –0.029	71	86	52	42	7	25	13	13	12.5	–
ULTR 32	4 rows	1250	560.0	78	0 –0.029	80	103	63	52	8	25	17	17	12.5	–
ULTR 40	4 rows	2510	955.0	100	0 –0.034	100	130	79.5	64	10	33	20	20	16.5	–

Model No. ULTR A series					Spline-shaft dimensions and tolerances (mm)			Basic dynamic load rating C (N)	Basic static load rating C ₀ (N)	Dynamic torque rating T (N·m)	Static torque rating T ₀ (N·m)	Static torque rating (N·m)		Support-bearing basic load rating (N)	
	PCD	PCD ₁	sxe	d ₁	D ₀	Size toler- ance	d ₂					T _x	T _{x-2}	C	C ₀
ULTR 8	38	19	M2.6× 3	3.4	8	0 −0.01 5	3	1450	2870	2.1	3.7	7.4	50	690	240
ULTR 10	42	23	M3×4	3.4	10	0 −0.01 5	4	2670	4890	4.4	8.20	13.7	109	770	300
ULTR 13	50	25	M3×4	3.4	13	0 −0.01 8	7	2730	50700	21	39.2	18	116	2600	2200
ULTR 16	56	30	M4×6	4.5	16	0 −0.01 8	8	6120	11200	60	110.0	46	299	6700	6400
ULTR 20	64	36	M5×8	4.5	20	0 −0.02 1	10	8900	16300	105	194.0	110	560	7400	7800
ULTR 25	75	44	M5×8	5.5	25	0 −0.02 1	15	12800	23200	189	346.0	171	1020	9700	10600
ULTR 32	89	54	M6×10	6.5	32	0 −0.02 1	–	18600	23400	307	439.0	181	1470	10500	12500
ULTR 40	113	68	M6×10	9	40	0 −0.02 5	–	30800	37500	674	934.0	358	2940	16500	20700

Model No. ULTR B series	No. of ball rows	Mass (reference) (g)		Outer-cylinder dimensions and tolerances (mm)										
		Outer cylinder	Spline shaft (per 100 mm)	D	Size tolerance	L	D ₁	D ₆ h7	H	L ₁	E	PCD	PCD ₁	sxe
ULTR 16B	4 rows	510	150.0	52	0 –0.007	50	68	39.5	5	37	10	60	32	M5×8
ULTR 20B	4 rows	700	238.0	56	0 –0.007	63	72	43.5	6	48	12	64	36	M5×8
ULTR 25B	4 rows	930	370.0	62	0 –0.007	71	78	53	6	55	13	70	45	M6×8
ULTR 32B	4 rows	1800	560.0	80	0 –0.007	80	105	65.5	9	60	17	91	55	M6×10
ULTR 40B	4 rows	2900	955.0	100	0 –0.008	100	120	79.5	11	74	22	112	68	M6×10



UBNS2020R300 real 2D drawing. Units: mm.



UNS2020R300 real 2D drawing. Units: mm.

A ball screw and a ball spline combined on one shaft: the screw nut feeds linearly and positions, the spline nut rotates torque transmission — one shaft does Z-feed with rotation (SCARA Z-axes, pick-and-place units). Sizes Ø16 / 20 / 25 / 32 mm.

Spline-section ratings below. Ball-screw section data (lead, screw-section ratings C_a/C_{0a} , permissible speed) is given in the full engineering data sheet — request it with your inquiry.

Model No. UBS series	Hollow A (standard)		Hollow K screw-shaft I.D. d _b	Lead p _h	Basic rated load (kN)		Ball- center dia. d _p	Groove -root dia. d _c	Ball screw nut dimensions														Support- bearing basic rated load		Nut moment of inertia kg·m ²	Screw- shaft moment of inertia kg·m ² /m	Nut mass kg	Shaft mass kg/ m	Permi ssible speed min ⁻¹
	Screw -shaft O.D. d	Screw -shaft I.D. d _b			C _a kN	C _a kN			O.D. D g6	Flan ge dia. D ₁	Ove rall leng th L ₁	D ₃ h7	B E	H	B ₄	B ₅	PCD 1	PCD 2	S	d ₁	C _a kN	C _{0a} kN							
UBS 1616	16	11	8	16	3.9	7.2	16.65	13.7	48	64	40	36	31	6	21	10	56	25	M4	4.5	8.7	10.5	3.50×10 ⁻⁵	3.92×10 ⁻⁸	0.31	0.8	4200		
UBS 2020	20	14	10	20	6.1	12.3	20.75	17.5	56	72	49	43.5	39	6	21	11	64	31	M5	4.5	9.7	13.4	8.50×10 ⁻⁵	9.37×10 ⁻⁸	0.54	1.21	3370		
UBS 2525	25	18	15	25	9.1	19.3	26	21.9	66	86	56.9	52	42	7	25	13	75	38	M6	5.5	12.7	18.2	2.12×10 ⁻⁵	2.20×10 ⁻⁷	0.88	1.79	2690		
UBS 3232	32	23	—	32	13	29.8	33.25	28.3	78	103	73.5	63	58	8	25	14	89	48	M6	6.6	13.6	22.3	5.42×10 ⁻⁵	5.92×10 ⁻⁷	1.39	2.96	2100		

Model No.	Basic rated load (kN)		Static permissible torque M _A N·m	Basic rated torque		Ball screw nut dimensions								Nut mass kg	P ₃				
	C kN	C ₀ kN		C _T N·m	C _{0T} N·m	O.D. D7	Flange dia. D ₅ 0 –0.2		Overall length L ₂	H ₇	B ₇	d ₀							
UNS 1616	7.1	12.6	67.6	31.4	34.3	31 0 –0.013	51			50 0 –0.2	7	18	2	40	4.5	8	4.4	0.2 3	
UNS 2020	10.2	17.8	118	56.8	55.8	35 0 –0.016	58		63 0 –0.2	9	22.5	2	45	4.5	9.5	5.4	0.3 3		
UNS 2525	15.2	25.8	210	105	103	42 0 –0.016	65		71 0 –0.3	9	26.5	3	52	5.5	9.5	5.4	0.4 5		
UNS 3232	20.5	34	290	180	157	49 0 –0.016	77		80 0 –0.3	10	30	3	62	6.6	11	6.5	0.5 8		

Accuracy grades & the free-combination system

Accuracy interchangeability

Thanks to the four-point-contact structure, machining and measurement errors stay small: any outer cylinder pairs with any spline shaft of the same size. Grades and preload are ordered as codes — the mounting envelope does not change.

Shaft diameter size	Relative to the spline-shaft support-section axis						Perpendicularity of the flange mounting face relative to the spline-shaft axis ⁽²⁾		
	⑤ Radial circular runout of the component mounting section ⁽¹⁾			⑥ Perpendicularity of spline-section end faces ⁽¹⁾					
	Standard (No symbol)	High (H)	Precision (P)	Standard (No symbol)	High (H)	Precision (P)	Standard (No symbol)	High (H)	Precision (P)
3	33	14	8	22	9	6	27	11	8
4	33	14	8	22	9	6	27	11	8
5	33	14	8	22	9	6	27	11	8
6	33	14	8	22	9	6	27	11	8
8	33	14	8	22	9	6	27	11	8
10	41	17	10	22	9	6	33	13	9
12	41	17	10	22	9	6	33	13	9
15	46	19	12	27	11	8	33	13	9
20	46	19	12	27	11	8	33	13	9
25	53	22	13	33	13	9	39	16	11
30	53	22	13	33	13	9	39	16	11
40	62	15	15	39	16	11	46	19	13
50	62	15	15	39	16	11	—	—	—

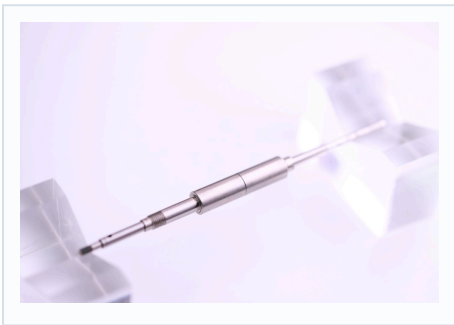
Total spline-shaft length (mm)		Shaft diameter size								
		3, 4, 5, 6, 8			10, 12			15, 20		
		Standard (No symbol)	High (H)	Precision (P)	Standard (No symbol)	High (H)	Precision (P)	Standard (No symbol)	High (H)	Precision (P)
—	200	72	46	26	59	36	20	56	34	18
200	315	133	89	57	83	54	32	71	45	25
315	400	185	126	82	103	68	41	83	53	31
400	500	236	163	108	123	82	51	95	62	38
500	630	—	—	—	151	102	65	112	75	46
630	800	—	—	—	190	130	85	137	92	58
800	1 000	—	—	—	—	—	—	170	115	75
1 000	1 250	—	—	—	—	—	—	—	—	—

Accuracy grade	Standard (No symbol)	High (H)	Precision (P)
Permissible value	33	13	6

Free-combination system. Outer cylinders and spline shafts are supplied as single pieces and paired freely — stock only one of the two, swap a worn cylinder in minutes, or upgrade rigidity by changing only the cylinder length.



UVT endurance test rig — SMT mounter conditions.



Custom integrated spline unit for an automation builder (actual product).

Endurance test — SMT mounter conditions

Test condition	Value
Mounting orientation	Vertical shaft
Maximum speed	860 mm/s
Acceleration	10 G
Cycle frequency	18.2 Hz
Stroke length	15 mm

Total reciprocation cycles achieved

Model	UVT 5	UVT 6	UVT 8	UVT 10	UVT 12
Million cycles	779	743	692	767	880

Under these conditions the standard type achieved a total of **400 million reciprocation cycles** — under general SMT-mounter conditions a service life of over 5 years can be expected. Severe-environment non-standard Φ 4 mm units exceeded 500 million cycles.

Where UVT ball splines work

- **SMT placement / pick-and-place** — Z-axes, nozzle shafts, limited-stroke units (US series).
- **Semiconductor packaging & inspection** — high-precision linear + torque axes, cleanroom-compatible options.
- **SCARA & industrial robots** — Z-axis ball screw splines (UBNS/UNS), rotary axes (ULTR).
- **Dispensing, bonding, burnishing** — rotary + linear travel in one unit.

Replacing THK / NB / IKO / NSK — the honest way

Our discipline. Every cross-reference below is a **Potential Alternative** until UVT engineering has confirmed the mounting envelope, ratings and accuracy against your actual part. We never claim “fully interchangeable” or “100 % replacement” — and we do not guess parameters. Send the current model, we check, then we commit.

1 · THK sizes that are discontinued (THK official notices)

THK series	Sizes	Status (THK official)	THK's own recommended path
LBS6 / LBS8 / LBS10	Ø6 / 8 / 10	Last order date 15 Mar 2022	LT6X / LT8X / LT10X
SLS / SLS-L / SLF	Ø70 / 80 / 100	Production ended 2026-06	Not listed
LBR	Ø60 / 70 / 85 / 100	Production ended 2026-06	Not listed
LBG / LBG T	Ø60 / 85	Production ended 2026-06	Not listed

Source: THK official discontinuation notices (thk.com), cross-checked across five language sites. These are normal product-life-cycle changes, stated here as facts. If your machine was built around one of these sizes, send us the model — UVT engineering will check a potential alternative.

2 · IKO LSAG vs UVT — basic dynamic load rating C

Size	IKO LSAG (distributor data)	UVT	Difference	Position
Φ3	Not listed in the channel*	251 N	—	UVT strength
Φ4	Not listed in the channel*	303 N	—	UVT strength
Φ5	587 N	441 N	–25 %	We recommend Φ6 (711 N) or ULT Φ6 (1220 N)
Φ8	1190 N	1190 N	Parity	Direct comparison OK
Φ10	1880 N	1800 N	–4.3 %	Workable — case by case

*Not listed in the RS Components distribution channel at the time of verification (2026-08); the IKO official catalogue was not checked. Distributor-published ratings; UVT values from the UVT catalogue tables.

3 · Family-level potential alternatives

Current product	Category	UVT family	Status
NB SPLFS	Limited-stroke ball spline	US series	Potential Alternative
NB SPBR / SPBF	Ball screw spline (integrated)	UBNS	Potential Alternative
THK BNS / BNS-A / BNS-V	Ball screw spline (model string on SCARA Z-axis BOMs)	UBNS	Potential Alternative
IKO LSAGF / LSAGFL	Flanged linear ball spline	ULF / ULTF	Potential Alternative
NSK Σ-series robot screw spline	Hollow-shaft ball screw spline	UBNS	Potential Alternative

4 · What to send for an equivalent-selection check

- ▶ Current brand and full model number (or the machine's BOM line)
- ▶ Mounting dimensions: shaft Ø, outer-cylinder OD × L, flange pattern
- ▶ Stroke, load, speed / acceleration, duty cycle
- ▶ Environment (cleanroom / dust / temperature) and annual quantity



Actual custom units built by UVT: integrated shafts, special flanges, hollow and reduced-head designs.

Delivery policy

Order quantity	Standard dispatch
Under 10 sets	5–7 days
10–100 sets	Approx. 1 month
Over 100 sets	1–2 months

MOQ 1 set. Non-standard customization supported: special lengths, hollow shafts, flange modifications, integrated assemblies, black-chrome plating, cleanroom options.

How to get a quotation

- 1

Send the model or the drawing. UVT model number — or your current part for an equivalent-selection check.
- 2

We confirm feasibility. Mounting envelope, ratings, accuracy grade and preload — engineering-checked, not guessed.
- 3

Sample first. 1-set prototypes with 5–7-day dispatch; CAD (STEP / 2D PDF) available for every series.
- 4

Scale up. Volume pricing and delivery scheduling for 10–100+ sets.

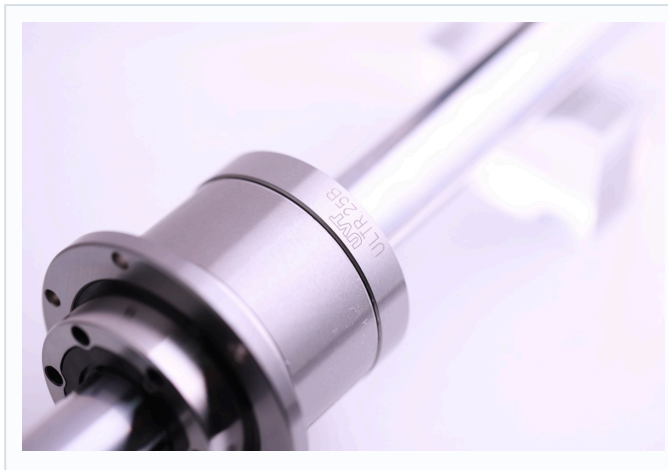
Tell us three things in your first message: **the model (or drawing), the application, and the quantity** — we will come back with a feasibility answer and a quotation path.

Quality, safety & environment

- ▶ Quality management — GB/T 19001-2016 / **ISO 9001:2015**
- ▶ Environmental management — GB/T 24001-2016 / **ISO 14001:2015**
- ▶ Occupational health & safety — GB/T 45001-2020 / **ISO 45001:2018**
- ▶ **20+ patents** granted (utility model and design patents)

Scope of supply

- Super-precision ball splines Ø2–100 mm, 2- and 4-groove, cylindrical / flange / trimmed-flange / rotary / limited-stroke
- Ball screw splines (UBNS / UNS) Ø16–32 mm
- Free-combination components: outer cylinders and spline shafts ordered separately
- Non-standard customization and integrated assemblies
- CAD data: STEP 3D + 2D PDF for every standard model



ULTR B rotary ball spline (actual product).

Data statement. All dimensions in mm. Technical data in this guide are taken from UVT verified technical documentation and UVT engineering drawings. Cross-references to other brands are Potential Alternatives pending engineering confirmation. Product appearance may change with product updates; the confirmed specification at time of order prevails.