

High Precision Spindle Bearings
Angular Contact Ball Bearings
with Ball Separators
Bearing Cartridges
Ball Screw Support Bearings

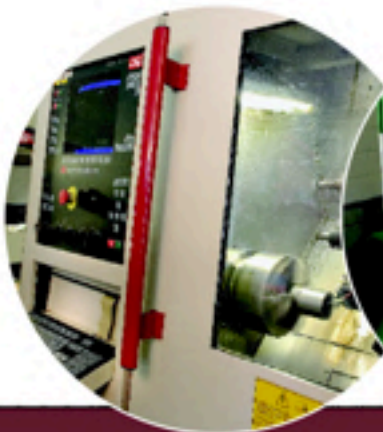


UKF: High Precision Bearings and Bearing Cartridges

UKF bearings, single-row, double-row and multi-row cartridge assemblies, embody experience and continuous product and process improvement. Single-source product design, development and manufacture provide the customer with maximum value.

UKF bearings with ball separators, in lieu of conventional rigid cage configurations, fulfill the requirements for the most demanding accuracy and longevity applications.

UKF 





High Precision Spindle Bearings

**Angular Contact Ball Bearings
with Ball Separators**

Bearing Cartridges

Ball Screw Support Bearings

This catalogue supersedes all previous issues (No. 6011)

We reserve the right to make changes which serve the technical progress

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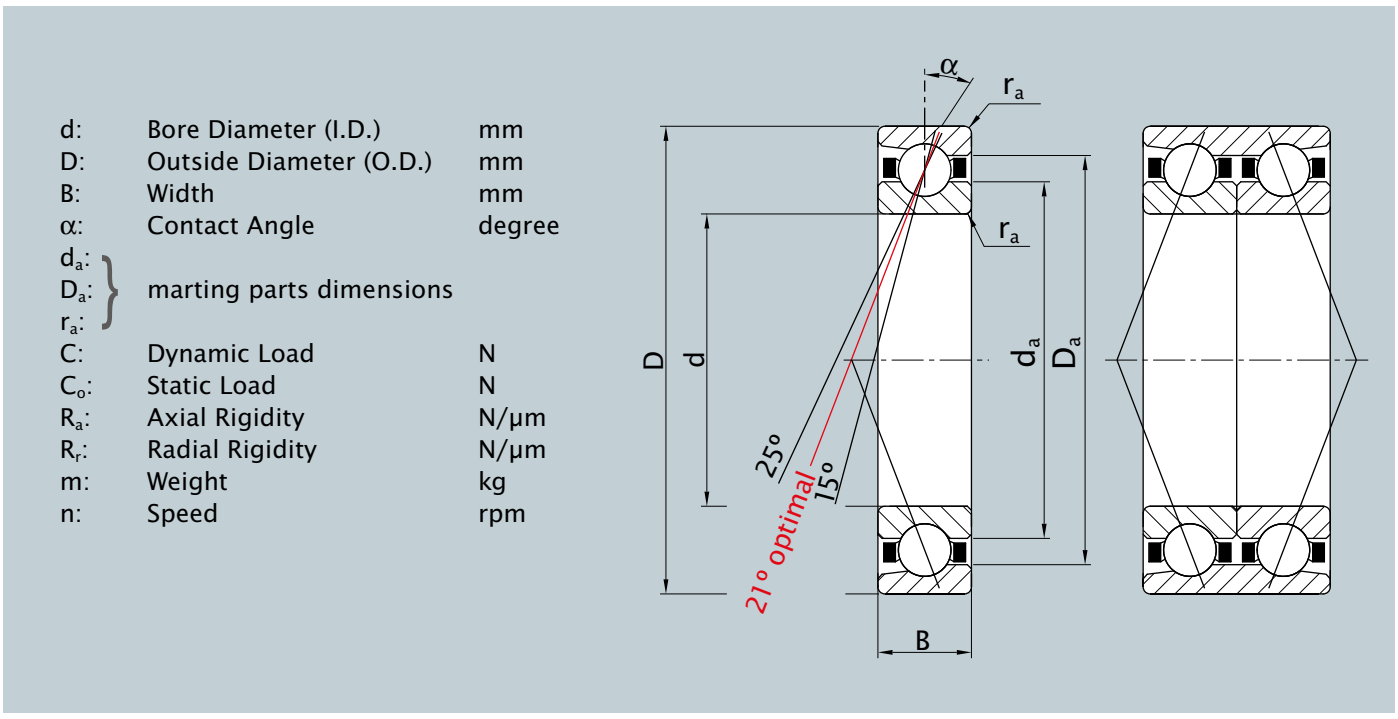
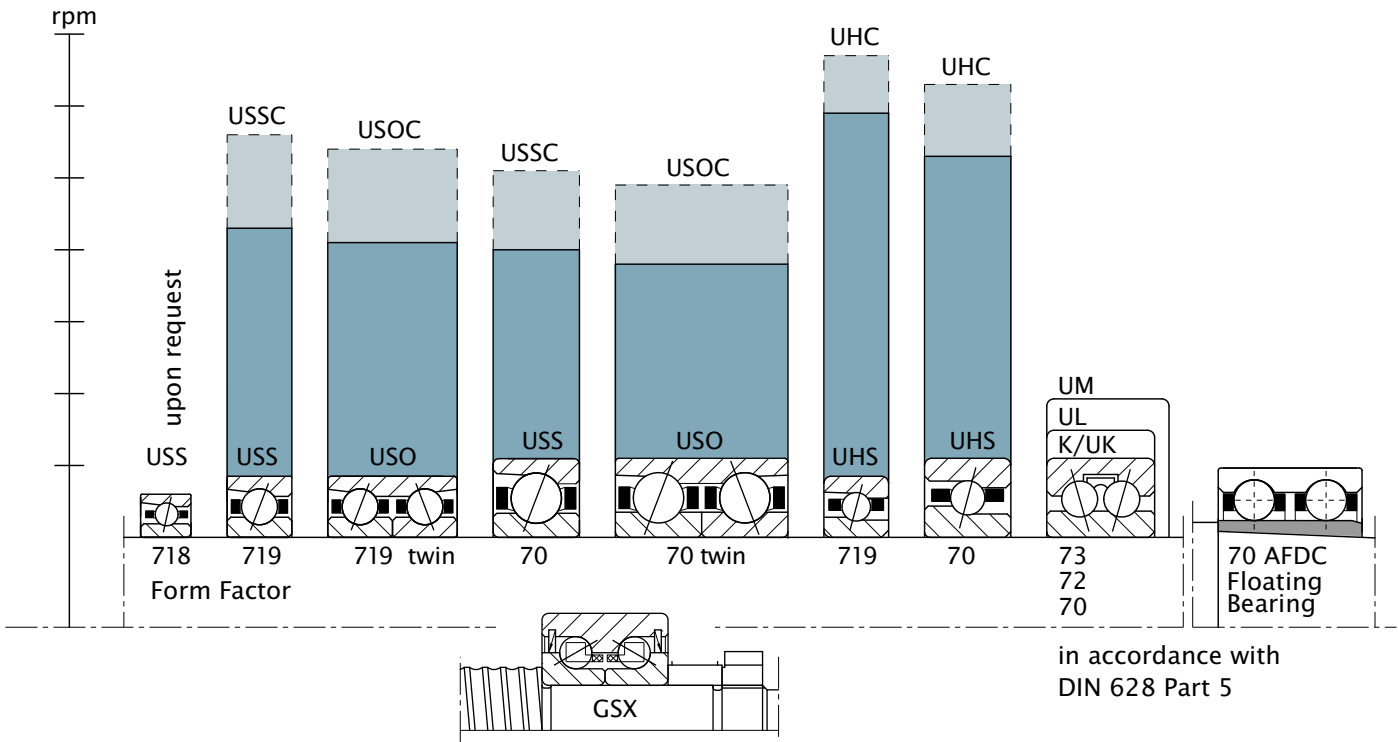
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Range of UKF Spindle Bearings



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
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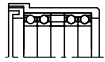
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
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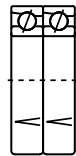
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Bearing Sets

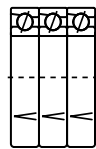
∅∅	DB O-Configuration (USO-Type)
∅∅	DT Tandem
∅∅	DF X Configuration
∅∅∅	TT Triplex
∅∅∅	TBT Tandem-O
∅∅∅∅	QBC Tandem-O-Tandem
∅∅∅∅	2DB Double-O
∅∅∅∅∅	PBC



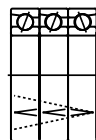
„O-configuration” DB
2 single row or
1 double row bearing (USO Type)



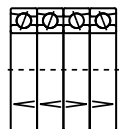
„Tandem” DT



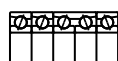
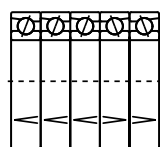
„Triplex” TT



„Tandem-O” TBT
3 single row or
1 single row and
1 double row bearing

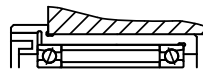


„Quattro” QBC
4 single row or
2 single row and
1 double row bearing



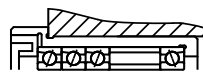
PBC
5 single row or
3 single row and
1 double row bearing

Bearing Cartridges

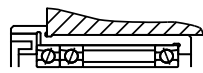


A pair of single bearings, or a double-row bearing in O-configuration (DB) Outstanding parallelism and high running precision, higher stiffness, and simple installation, all by locking the inner rings against each other. Single-piece outer ring is also advantageous for applications requiring a Floating Bearing within its housing

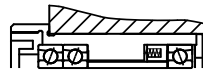
for mid-size axial forces, higher speeds, such as Internal Grinding



for higher axial forces and medium speeds, such as drilling



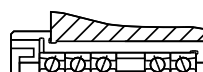
for axial forces with medium or higher speeds, such as Milling, Turning, Fine boring.



Optional: Bearing Set with spring for proper pre-load



for higher radial and axial forces in both directions, including External Grinding



for higher radial and axial forces, such as heavy duty Milling/Drilling

Preload and Rigidity

Preloaded bearings provide both High Running Precision and High Rigidity even under load (axial and radial forces). In their free state, such Inner Rings appear slightly offset, but seat coplanar upon proper installation, in accordance with the factory preload settings. Similarly, double row UKF-Spindle Bearings Type “USO” have a small gap between the Inner Rings, which closes during assembly, applying the correct preload.

Because preload translates into friction, use only the amount necessary—no more! Besides the usual classes of preload, L/M/S, UKF can also, upon request, prepare the bearings with preloads meeting specific requirements. For example: „Super Light“ with its value lower than standard „Light“.

Rigidity, resulting from the bearing’s geometry, its preload, and its assembly and fit parameters (shaft and housing tolerances) will determine the running accuracy of the Bearings/Spindle. Multiple-row Bearing Assemblies provide inherently advantageous dimensional tolerances. Consequently, the unitized, double-row Outer Ring of “USO”-Type Bearings yields much higher stiffness to Bearing Assemblies, such as the TBT and QBC configurations, for example, below.

Stiffness of Bearing Sets				
Bearing assembly		$R_{a, Set}$ [N/ μ m]		$R_{r, Set}$ [N/ μ m]
$\emptyset \emptyset$	DB		R_a	R_r
$\emptyset \emptyset$	DT	2	R_a	R_r
$\emptyset \emptyset \emptyset$	TBT	1,83	R_a	1,42 R_r
$\emptyset \emptyset \emptyset \emptyset$	QBC	2	R_a	2 R_r
R_a, R_r Rigidity see tables for respective series				

Load capacity and speed (RPM)

The static and dynamic load capacity shown in the tables is for single row- or double row-bearings as per the type specification. Compared with single row-bearings, Double row-bearings achieve approximately twice the load capacity; unlike separate bearings, the load distribution is uniform.

*attuned to each requirement:
application-specific preloads*

*Double Row Bearings with
higher stiffness*

For Dynamic load capacity, see “calculation basics”, page 56. Relationship between „speed—load capacity—lifetimes” is also shown.

For technical and design characteristics of specific bearing row configurations, including fatigue life calculations, please request a proposal from our Applications Engineering Department.

We stand ready to assist you.

Designs with Ceramic Balls (Hybrid Bearings)

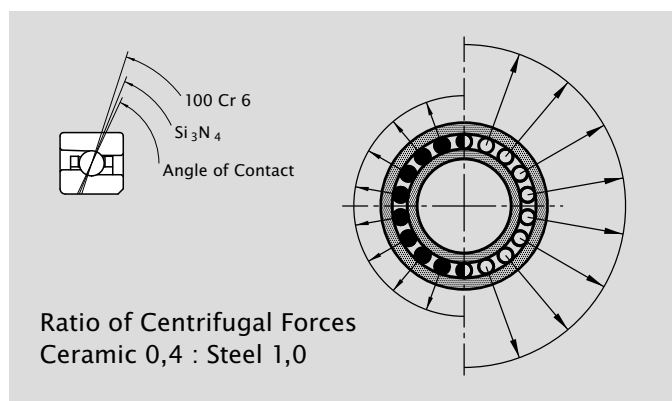
Silicon-Nitride, Si_3N_4 , is an exceptionally strong and rigid compound, with merely 40% of the specific gravity of steel. Balls made from this material can operate at both higher speeds, and for longer life cycles. Lower centrifugal forces and lower friction allow reduced wear and lower temperature rise.

The approximately 1.5-fold increase in the modulus of elasticity, in relation to steel balls, yields higher bearing rigidity, as shown in the table.

Hybrid Bearings with their special greases provide an easy path to increase both speed limits and rigidity, while maintaining the same bearing form-factor.

Marking: "...C" within the Type Specification USS/USO → USSC/USOC, UHS → UHC, for example 70 UHC 50...

Steel	Hardness	Elasticity	Density
100 Cr6	HV 700	210 kN/mm	7,9 g/cm ³
Si_3N_4	HV 1600	320 kN/mm	3,2 g/cm ³



Design "XH" of CRONIDEX®-Steel

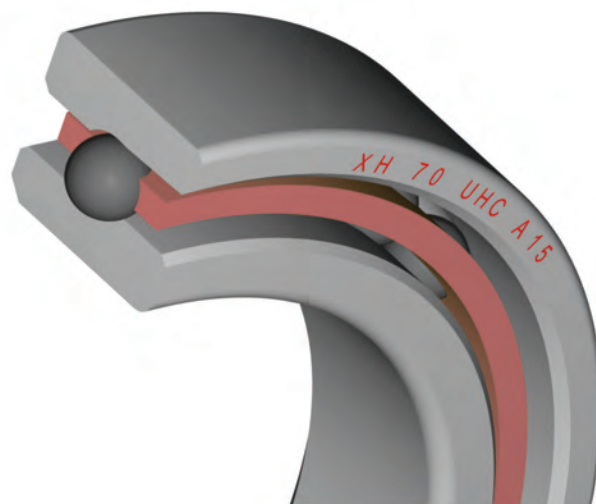
Developed as corrosion-resistant steel for aerospace applications, this alloy's high strength has also proven itself to be ideal for Spindle Bearings. Compounded with carbon, molybdenum, and increased levels of nitrogen, it achieves a hardness comparable to Bearing Steel 100 Cr 6, > 58 HRC, but with higher fatigue and wear resistance.

For Spindle Bearings, this means:

- longer life (fatigue-endurance)
- higher dynamic rating (load capacity)
- higher operating speeds (cutting speed)
- lower temperature rise.

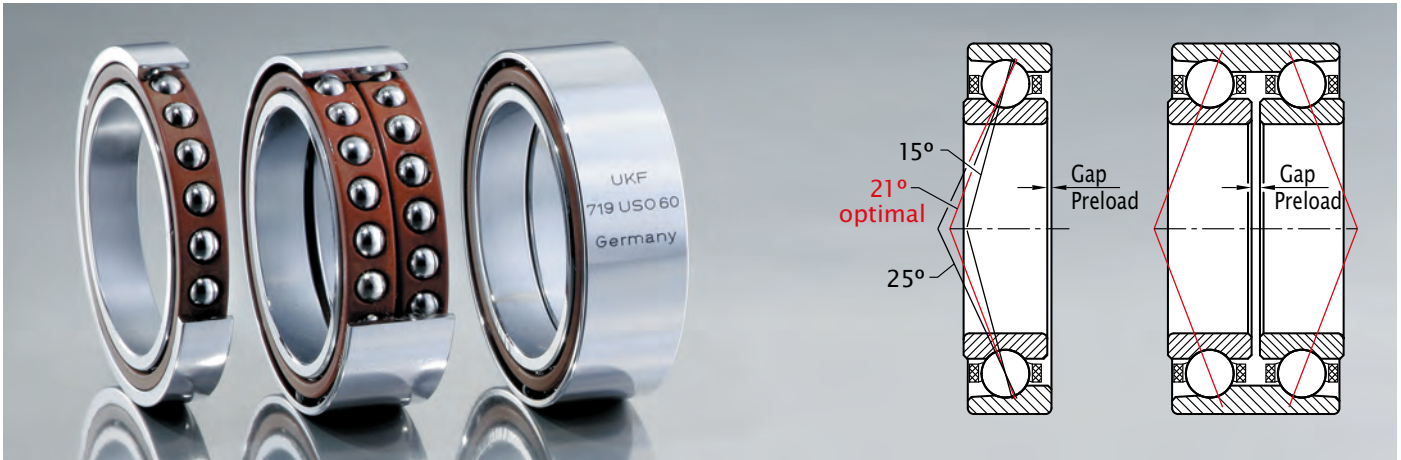
UKF Spindle Bearings marked "XH", that is with ceramic balls (Hybrid Bearings "...C"), are available with either permanent, long life grease lubrication or continuous lubrication ("LB"), represent the current state-of-the-art in Spindle Bearing Design:

- "XH USSC..." Hybrid Spindle Bearing, Single Row
- "XH USOC..." Hybrid Spindle Bearing, Double Row
- "XH UHC..." Hybrid High Speed Spindle Bearing, Single Row



UKF Spindle Bearings

Series 719, 70 USS Single Row / USO Double Row



Experience and Development

High-accuracy rotation, power, and load forces can all be fulfilled with UKF Bearings and Bearing Cartridges. Bearings are also available as Double-Row-Bearings, with application-optimised contact angle, variable pre-load, special alloy steels, and even Special Designs for particular application, all upon request.

Design: Single row „USS“ or Double row “USO”; made of Bearing Steel 100 Cr 6, or high strength CRONIDEX®, Steel or Ceramic balls, and self-guiding full retainers (fibre, brass). Series 71 9 and 70, i.e., dimension series 19 and 10, are in accordance with DIN 628-6. Series 718 available upon request.

Dimensions for UKF Double Row Spindle Bearings correspond to a standard pair of Single Row Bearings in O-configuration („DB“). Double row Bearings, relative to Single bearings, have better axial running accuracy due to the unitized outer ring and provide higher speed limits; the one-part outer ring imparts a higher stiffness to the bearing seat, and as a Floating Bearing, yields better axial guidance. Another advantage is the central lubricant feed, and the resulting extended lubricant reserve between the bearings. Assembly is simplified with reduced parts handling, and the bearings have the proper preload set at the factory. The inner rings need only to be locked against each other.

Note: Two Single Row-Bearings “70 USS 50” “DB” correspond to one Double Row-Bearing “70 USO 50”. UKF bearings may also be combined to provide other configurations, for example: combining one each USS and USO can make a TBT arrangement. UKF Spindle Bearings, in general, are produced as “Universal-Bearings”, so that they may readily be assembled into different bearing configurations. Consequently, this feature, combined with the optimised contact angle, $\alpha = 21^\circ$, instead of 15° or 25° , facilitates both production and spares inventories and logistics.

Double Row „USO“:
*higher speeds, higher accuracy,
 easier assembly*
Optimum Contact Angle of 21° :
*Best configuration for increased
 axial load capacity and maximum
 speed limit*

Options

Special Contact Angles, ranging from 12° to 30° , as per agreement. Bearings with integral shields → page 26

Lubrication feed, through the outer ring, directly into the raceway → page 26

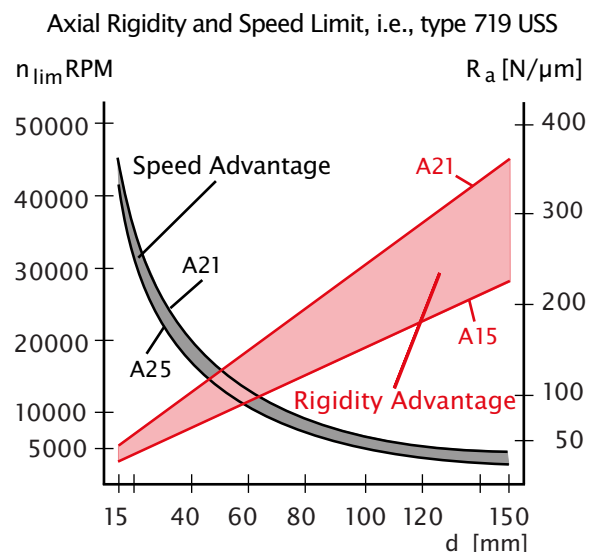
Pre-lubricated bearings; packed with proven high-performance grease; filled with the exact quantity - so bearing is ready for installation → page 46

Notice: the High Speed Spindle Bearings → page 18
 These are furnished with a 15° contact angle, respectively, 25° upon application

Optimum 21° Contact Angle

With an intermediate contact angle of $\alpha = 21^\circ$, these bearings achieve excellent performance advantages over the more common 15° and 25° contact angles:


- compared to 15° , a higher axial rigidity and axial load capacity
- compared to 25° , a higher Speed Limit, i.e., higher RPM.

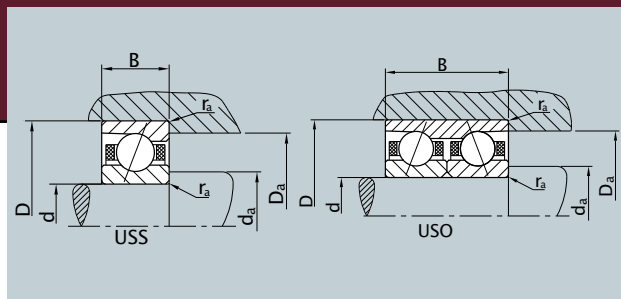


UKF Spindle Bearings

Series 719 USS, 719 USO
and 70 USS, 70 USO

Single-/Double row with fibre cage, preloaded, optimal angle of contact $\alpha = 21^\circ$; $15^\circ \dots 25^\circ$ upon request.

Calculation factors for Speed Limit (Precision, Preload, Configuration)  Calculation Principles



Dimensions:

USS comparable to Single Row Bearing Series 719/70

USS comparable to a Pair Single Row Bearings Series 719/70

Nominal Size	UKF Type			Ratings		Speed Limit		Seat Dimensions			Mass m kg
	d mm	D mm	B mm	C ₀ N	C N	n _{lim} RPM Grease lubrication	n _{lim} RPM minimum oil lubrication	r _a	d _a mm	D _a	
15	28	7	719 USS 15	2600	4600	44000	67000	0,15	17,5	25,5	0,02
	28	14	719 USO 15	5100	7500	41000	64000	0,15	17,5	25,5	0,03
	32	9	70 USS 15	3600	6400	39500	61000	0,3	18,5	28,5	0,03
	32	18	70 USO 15	7200	10500	37500	58000	0,3	18,5	28,5	0,06
17	30	7	719 USS 17	2800	4800	40000	62000	0,15	19,5	27,5	0,02
	30	14	719 USO 17	5700	7900	37500	59000	0,15	19,5	27,5	0,03
	35	10	70 USS 17	4000	6800	36000	55000	0,3	21,0	31,0	0,04
	35	20	70 USO 17	8000	11000	34000	53000	0,3	21,0	31,0	0,08
20	37	9	719 USS 20	3700	6400	33000	51000	0,15	23,0	34,0	0,04
	37	18	719 USO 20	7500	10400	31000	48000	0,15	23,0	34,0	0,07
	42	12	70 USS 20	6400	10800	30000	46000	0,6	25,0	37,0	0,07
	42	24	70 USO 20	12800	17600	28000	44000	0,6	25,0	37,0	0,14
25	42	9	719 USS 25	4600	6900	28000	43000	0,15	28,0	39,0	0,04
	42	18	719 USO 25	9200	11200	26500	41000	0,15	28,0	39,0	0,08
	47	12	70 USS 25	7300	11300	26000	40000	0,6	30,0	42,0	0,08
	47	24	70 USO 25	14500	18400	24000	38000	0,6	30,0	42,0	0,16
30	47	9	719 USS 30	5500	7800	24000	37500	0,15	33,0	44,0	0,05
	47	18	719 USO 30	11000	12500	23000	36000	0,15	33,0	44,0	0,09
	55	13	70 USS 30	9300	14700	22000	34000	1,0	36,0	49,0	0,11
	55	26	70 USO 30	18600	24000	21500	32000	1,0	36,0	49,0	0,22
35	55	10	719 USS 35	7700	10300	21000	32000	0,3	39,5	50,5	0,08
	55	20	719 USO 35	15500	16700	19500	30500	0,3	39,5	50,5	0,15
	62	14	70 USS 35	12300	18100	19500	29500	1,0	41,5	55,5	0,15
	62	28	70 USO 35	24100	32500	18500	28000	1,0	41,5	55,5	0,30
40	62	12	719 USS 40	10500	13500	18000	28000	0,3	44,0	58,0	0,11
	62	24	719 USO 40	21500	22000	17000	27000	0,3	44,0	58,0	0,22
	68	15	70 USS 40	13600	18500	17000	26000	1,0	47,0	61,0	0,18
	68	30	70 USO 40	27200	30000	16000	25000	1,0	47,0	61,0	0,36
45	68	12	719 USS 45	11500	13500	16500	25000	0,3	49,5	63,5	0,13
	68	24	719 USO 45	23500	22000	15500	24000	0,3	49,5	63,5	0,26
	75	16	70 USS 45	19000	25800	15500	24000	1,0	51,5	68,5	0,24
	75	32	70 USO 45	38600	42000	14500	23000	1,0	51,5	68,5	0,48
50	72	12	719 USS 50	12000	14000	15500	24000	0,3	54,0	68,0	0,13
	72	24	719 USO 50	24500	23000	14500	23000	0,3	54,0	68,0	0,26
	80	16	70 USS 50	22000	27800	14000	22000	1,0	56,5	73,5	0,25
	80	32	70 USO 50	44300	45000	13500	21000	1,0	56,5	73,5	0,50
55	80	13	719 USS 55	18700	19000	14000	21000	0,3	59,5	75,5	0,18
	80	26	719 USO 55	37500	35000	13000	20000	0,3	59,5	75,5	0,36
	90	18	70 USS 55	24200	28200	12500	20000	1,0	62,0	83,0	0,38
	90	36	70 USO 55	48400	46000	12000	19000	1,0	62,0	83,0	0,76
60	85	13	719 USS 60	21000	22500	13000	20000	0,3	64,5	80,5	0,19
	85	26	719 USO 60	42500	36500	12000	19000	0,3	64,5	80,5	0,37
	95	18	70 USS 60	26800	31400	12000	18500	1,0	67,0	88,0	0,41
	95	36	70 USO 60	53700	51000	11000	17500	1,0	67,0	88,0	0,82

UKF Spindle Bearings

Series 719 USS, 719 USO
and 70 USS, 70 USO

Bearing Sets and Calculation Factor f_3 for Speed Limit

single row	$\emptyset \emptyset \emptyset \emptyset$	$f_3 = 1,0$	double row, like USO
DT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,95$	
DB	$\emptyset \emptyset \emptyset \emptyset$	$= 0,9$	DB $\emptyset \emptyset$ $= 1,0$
TBT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,75$	TBT $\emptyset \emptyset \emptyset^{**}$ $= 0,9$
QBC	$\emptyset \emptyset \emptyset \emptyset$	$= 0,85$	QBC $\emptyset \emptyset \emptyset \emptyset^{**}$ $= 0,85$
☛ Calculation Principles			** combined with USS

Nominal Size			UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass
d	D	B		C ₀	C	n _{lim} RPM		r _a	d _a	D _a	m
mm				N	N	Grease lubrication	minimum oil lubrication	mm			kg
65	90	13	719 USS 65	22000	23000	12000	18500	0,3	69,5	85,5	0,21
	90	26	719 USO 65	44000	37500	11500	17500	0,3	69,5	85,5	0,41
	100	18	70 USS 65	28400	32100	11000	17500	1,0	72,0	93,0	0,43
	100	36	70 USO 65	56900	52000	10500	16000	1,0	72,0	93,0	0,85
70	100	16	719 USS 70	29000	30000	11000	17000	0,3	75,5	94,5	0,33
	100	32	719 USO 70	58000	49000	10000	16000	0,3	75,5	94,5	0,66
	110	20	70 USS 70	37800	42000	10000	16000	1,0	78,0	102,0	0,60
	110	40	70 USO 70	75500	68600	9500	15000	1,0	78,0	102,0	1,20
75	105	16	719 USS 75	30500	31000	10000	16000	0,3	80,5	99,5	0,35
	105	32	719 USO 75	61000	50500	9500	15000	0,3	80,5	99,5	0,70
	115	20	70 USS 75	40000	43000	9500	15000	1,0	83,0	107,0	0,61
	115	40	70 USO 75	80000	71000	9000	14500	1,0	83,0	107,0	1,35
80	110	16	719 USS 80	32000	31000	9500	15000	0,3	85,5	104,5	0,38
	110	32	719 USO 80	64000	51000	9000	14500	0,3	85,5	104,5	0,75
	125	22	70 USS 80	50500	57100	9000	14000	1,0	89,0	116,0	0,87
	125	44	70 USO 80	101000	92800	8500	13000	1,0	89,0	116,0	1,75
85	120	18	719 USS 85	41500	41000	9000	14000	0,6	92,5	114,5	0,53
	120	36	719 USO 85	83000	67000	8500	13500	0,6	92,5	114,5	1,05
	130	22	70 USS 85	57500	60500	8500	13500	1,0	94,0	121,0	0,90
	130	44	70 USO 85	115000	98800	8000	13000	1,0	94,0	121,0	1,80
90	125	18	719 USS 90	43500	42400	8500	13500	0,6	96,5	118,5	0,58
	125	36	719 USO 90	87000	69000	8000	13000	0,6	96,5	118,5	1,15
	140	24	70 USS 90	69000	74000	8000	12500	1,2	100,0	130,0	1,15
	140	48	70 USO 90	139000	121000	7500	12000	1,2	100,0	130,0	2,30
100	140	20	719 USS 100	59000	55500	7500	12000	0,6	107,0	132,0	0,78
	140	40	719 USO 100	118500	90000	7000	11500	0,6	107,0	132,0	1,56
	150	24	70 USS 100	78500	78600	7500	11500	1,2	110,0	140,0	1,30
	150	48	70 USO 100	157000	127500	7000	11000	1,2	110,0	140,0	2,60
110	150	20	719 USS 110	62000	55000	7000	11000	0,6	117,0	143,0	0,85
	150	40	719 USO 110	124000	90000	6500	10500	0,6	117,0	143,0	1,70
	170	28	70 USS 110	100000	103000	6500	10000	1,2	122,0	158,0	2,00
	170	56	70 USO 110	200000	167000	6000	9500	1,2	122,0	158,0	4,00
120	165	22	719 USS 120	78500	68900	6500	10000	0,6	128,0	151,0	1,15
	165	44	719 USO 120	157000	112000	6000	9500	0,6	128,0	151,0	2,30
	180	28	70 USS 120	107000	105000	6000	9200	1,5	132,0	168,0	2,15
	180	56	70 USO 120	215000	171000	5800	9000	1,5	132,0	168,0	4,30
130	180	24	719 USS 130*	92500	83000	6000	9400	0,6	139,0	171,0	1,55
	180	48	719 USO 130*	185000	134000	5500	9000	0,6	139,0	171,0	3,10
	200	33	70 USS 130*	136600	136300	5600	8600	1,5	144,5	185,5	3,25
	200	66	70 USO 130*	273000	221000	5000	8200	1,5	144,5	185,5	6,55
140	190	24	719 USS 140*	100000	85500	5500	8500	0,6	148,5	181,5	1,63
	190	48	719 USO 140*	201000	139000	5000	8000	0,6	148,5	181,5	3,26
	210	33	70 USS 140*	146000	139000	5200	8000	1,5	154,5	195,5	3,50
	210	66	70 USO 140*	293000	226000	4800	7500	1,5	154,5	195,5	7,00
150	210	28	719 USS 150*	133000	115000	5000	8000	1,0	161,0	199,0	2,55
	210	56	719 USO 150*	266500	187000	4500	7500	1,0	161,0	199,0	5,10
	225	35	70 USS 150*	178000	175000	4800	7500	1,5	165,5	209,5	4,25
	225	70	70 USO 150*	357000	284000	4400	7200	1,5	165,5	209,5	8,50

* upon request



Preload and Rigidity

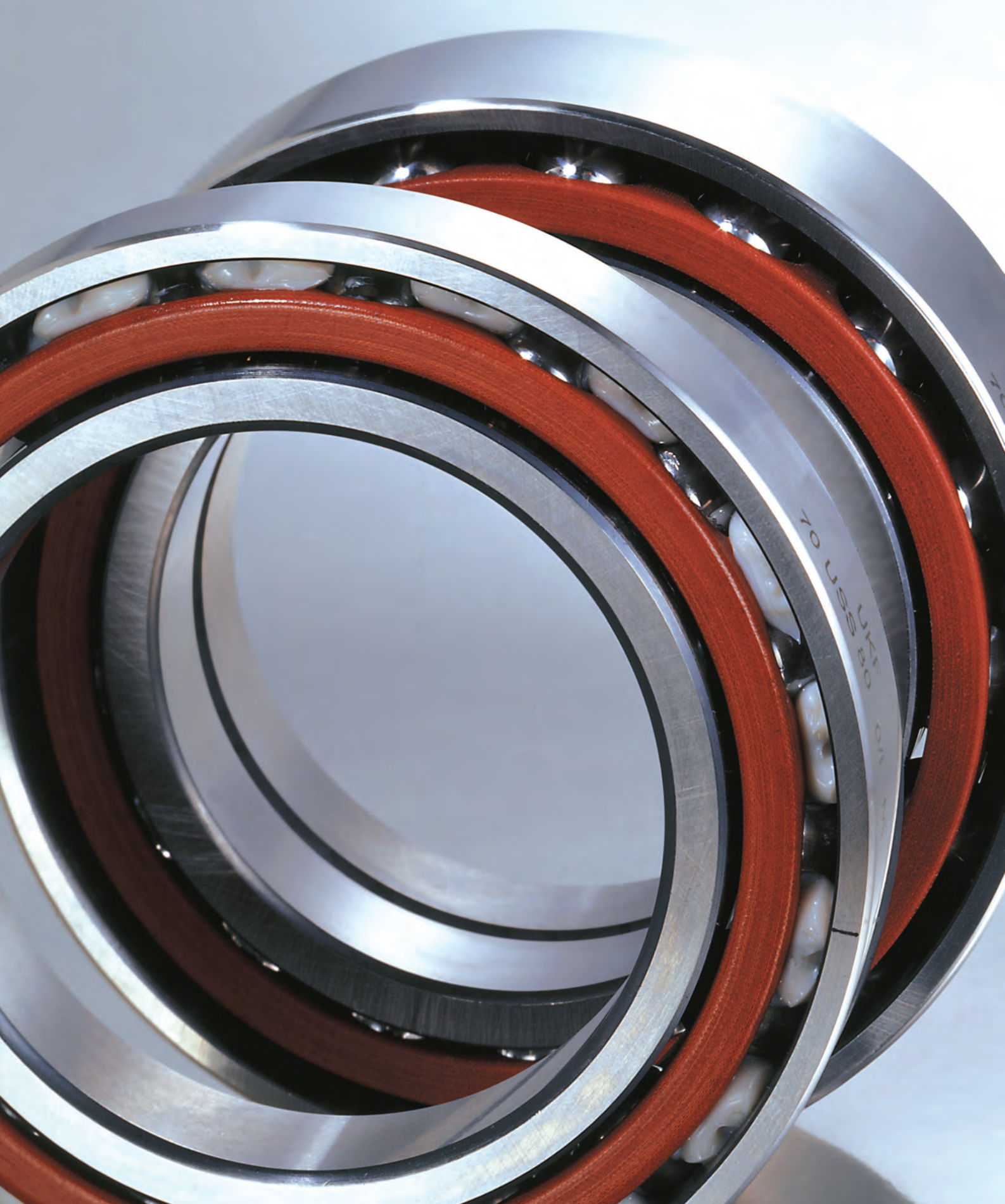
UKF Spindle Bearings with Steel Balls

Optimal Contact Angle $\alpha = 21^\circ$

Compared to 15° -Bearings, only slightly reduced Maximum Speed, but approximately 60 % higher Axial Rigidity !

Series 719 USS, 70 USS as Single Row (paired in O- or X-arrangement), 719 USO, 70 USO as Double Row

UKF Type			Axial Preload $F_V(N)$			Axial Rigidity $R_a(N/\mu m)$			Radial Rigidity $R_r(N/\mu m)$		
		d	L	M	S	L	M	S	L	M	S
719 70	USS / USO	15	30	100	200	29	43	54	115	175	220
	USS / USO		40	130	260	32	48	60	130	190	240
719 70	USS / USO	17	40	110	220	34	50	60	135	190	240
	USS / USO		50	150	310	36	52	66	145	210	265
719 70	USS / USO	20	60	180	360	42	60	76	170	240	305
	USS / USO		70	210	430	43	63	80	175	250	320
719 70	USS / USO	25	70	200	400	49	69	87	195	280	350
	USS / USO		80	240	470	51	74	93	205	300	375
719 70	USS / USO	30	70	220	440	53	78	98	215	315	395
	USS / USO		100	300	610	57	82	105	230	330	415
719 70	USS / USO	35	90	260	520	61	87	110	245	350	445
	USS / USO		120	350	700	68	91	120	275	390	495
719 70	USS / USO	40	100	290	580	68	97	120	275	390	490
	USS / USO		130	370	750	73	105	130	295	420	530
719 70	USS / USO	45	130	380	760	79	115	140	320	455	570
	USS / USO		170	500	1010	83	120	150	335	480	610
719 70	USS / USO	50	130	400	800	82	120	150	330	480	610
	USS / USO		180	530	1030	89	125	160	355	510	640
719 70	USS / USO	55	180	540	1040	95	140	170	385	560	690
	USS / USO		240	720	1420	105	150	185	415	600	750
719 70	USS / USO	60	190	560	1120	105	160	190	420	600	760
	USS / USO		250	750	1520	110	165	200	435	630	800
719 70	USS / USO	65	200	580	1160	110	165	195	440	630	790
	USS / USO		250	760	1540	115	170	205	455	660	830
719 70	USS / USO	70	250	750	1500	120	175	220	485	700	880
	USS / USO		330	1000	1940	130	185	235	520	750	940
719 70	USS / USO	75	260	780	1560	125	180	230	510	730	920
	USS / USO		340	1020	2040	135	195	245	545	790	990
719 70	USS / USO	80	270	810	1620	130	190	240	530	760	960
	USS / USO		410	1260	2520	140	205	255	570	820	1040
719 70	USS / USO	85	320	960	1920	145	205	260	580	840	1050
	USS / USO		430	1280	2560	150	215	270	600	860	1080
719 70	USS / USO	90	370	1100	2200	155	225	280	630	900	1140
	USS / USO		510	1520	3040	170	245	310	690	990	1250
719 70	USS / USO	100	440	1320	2640	170	250	310	690	1000	1260
	USS / USO		540	1620	3200	180	260	330	730	1060	1320
719 70	USS / USO	110	470	1420	2840	180	260	330	730	1050	1330
	USS / USO		720	2140	4300	205	295	375	830	1190	1500
719 70	USS / USO	120	550	1650	3300	200	290	365	810	1170	1470
	USS / USO		730	2200	4400	215	310	390	860	1240	1560
719 70	USS / USO	130	670	2020	4040	220	315	395	880	1270	1600
	USS / USO		930	2780	5600	230	335	420	940	1350	1700
719 70	USS / USO	140	720	2160	4320	230	330	415	920	1330	1680
	USS / USO		940	2880	5760	240	350	440	970	1410	1780
719 70	USS / USO	150	890	2680	5360	250	360	450	1000	1450	1830
	USS / USO		1100	3240	6440	260	370	465	1040	1490	1880



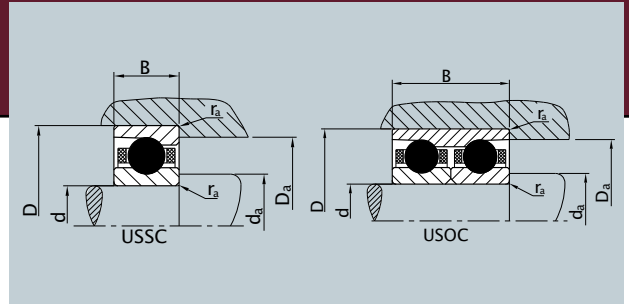
UKF Spindle Bearings with Ceramic Balls (Hybrid Bearings)

Series 719 USSC, 719 USOC and 70 USSC, 70 USOC

Single/Double row, with fibre cage, preloaded, optimal contact angle, $\alpha = 21^\circ$;
15°...25° upon request.

Calculation factors for Maximum Speed Limit (Precision, Preload, Configuration)

➡ Calculation Principles



Dimensions:

USSC comparable to Single Row Bearing Series 719/70

USOC comparable to a pair Single Row Bearings 719/70

Nominal Size			UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass
d	D	B		C ₀	C	n _{lim} RPM		r _a	d _a	D _a	m
mm	mm	mm	N	N	Grease lubrication	minimum oil lubrication	mm	mm	mm	kg	
15	28	7	719 USSC 15	1430	3220	61600	93800	0,15	17,5	25,5	0,01
	28	14	719 USOC 15	2805	5250	57400	89600	0,15	17,5	25,5	0,03
	32	9	70 USSC 15	1980	4480	55300	85400	0,3	18,5	28,5	0,03
	32	18	70 USOC 15	3960	7350	52500	81200	0,3	18,5	28,5	0,05
17	30	7	719 USSC 17	1540	3360	56000	86800	0,15	19,5	27,5	0,02
	30	14	719 USOC 17	3135	5530	52500	82600	0,15	19,5	27,5	0,03
	35	10	70 USSC 17	2200	4760	50400	77000	0,3	21,0	31,0	0,04
	35	20	70 USOC 17	4400	7700	47600	74200	0,3	21,0	31,0	0,07
20	37	9	719 USSC 20	2035	4480	46200	71400	0,15	23,0	34,0	0,03
	37	18	719 USOC 20	4125	7280	43400	67200	0,15	23,0	34,0	0,06
	42	12	70 USSC 20	3520	7560	42000	64400	0,6	25,0	37,0	0,06
	42	24	70 USOC 20	7040	12320	39200	61600	0,6	25,0	37,0	0,13
25	42	9	719 USSC 25	2530	4830	39200	60200	0,15	28,0	39,0	0,04
	42	18	719 USOC 25	5060	7840	37100	57400	0,15	28,0	39,0	0,07
	47	12	70 USSC 25	4015	7910	36400	56000	0,6	30,0	42,0	0,07
	47	24	70 USOC 25	7975	12880	33600	53200	0,6	30,0	42,0	0,14
30	47	9	719 USSC 30	3025	5460	33600	52500	0,15	33,0	44,0	0,04
	47	18	719 USOC 30	6050	8750	32200	50400	0,15	33,0	44,0	0,08
	55	13	70 USSC 30	5445	10290	30800	47600	1,0	36,0	49,0	0,10
	55	26	70 USOC 30	10890	16800	30100	44800	1,0	36,0	49,0	0,19
35	55	10	719 USSC 35	4235	7210	29400	44800	0,3	39,5	50,5	0,07
	55	20	719 USOC 35	8525	11690	27300	42700	0,3	39,5	50,5	0,13
	62	14	70 USSC 35	7370	12880	27300	41300	1,0	41,5	55,5	0,13
	62	28	70 USOC 35	14740	20790	25900	39200	1,0	41,5	55,5	0,26
40	62	12	719 USSC 40	5775	9450	25200	39200	0,3	44,0	58,0	0,10
	62	24	719 USOC 40	11825	15400	23800	37800	0,3	44,0	58,0	0,19
	68	15	70 USSC 40	7480	12950	23800	36400	1,0	47,0	61,0	0,16
	68	30	70 USOC 40	14960	21000	22400	35000	1,0	47,0	61,0	0,32
45	68	12	719 USSC 45	6325	9450	23100	35000	0,3	49,5	63,5	0,11
	68	24	719 USOC 45	12925	15400	21700	33600	0,3	49,5	63,5	0,23
	75	16	70 USSC 45	10450	18060	21700	33600	1,0	51,5	68,5	0,21
	75	32	70 USOC 45	21230	29400	20300	32200	1,0	51,5	68,5	0,42
50	72	12	719 USSC 50	6600	9800	21700	33600	0,3	54,0	68,0	0,11
	72	24	719 USOC 50	13475	16100	20300	32200	0,3	54,0	68,0	0,23
	80	16	70 USSC 50	12100	19460	19600	30800	1,0	56,5	73,5	0,22
	80	32	70 USOC 50	24365	31500	18900	29400	1,0	56,5	73,5	0,45
55	80	13	719 USSC 55	10300	13300	19600	29400	0,3	59,5	75,5	0,16
	80	26	719 USOC 55	20625	24500	18200	28000	0,3	59,5	75,5	0,32
	90	18	70 USSC 55	13310	19740	17500	28000	1,0	62,0	83,0	0,33
	90	36	70 USOC 55	26620	32200	16800	26600	1,0	62,0	83,0	0,67
60	85	13	719 USSC 60	11550	15750	18200	28000	0,3	64,5	80,5	0,16
	85	26	719 USOC 60	23375	25550	16800	26600	0,3	64,5	80,5	0,31
	95	18	70 USSC 60	14740	21980	16800	25900	1,0	67,0	88,0	0,35
	95	36	70 USOC 60	29535	35700	15400	24500	1,0	67,0	88,0	0,70

Bearing Sets and Calculation Factor f_3 for Speed Limit

single row	$\emptyset \emptyset$	$f_3 = 1,0$	double row, Type USO
DT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,95$	
DB	$\emptyset \emptyset \emptyset \emptyset$	$= 0,9$	DB $\emptyset \emptyset$ $= 1,0$
TBT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,75$	TBT $\emptyset \emptyset \emptyset^{**}$ $= 0,9$
QBC	$\emptyset \emptyset \emptyset \emptyset$	$= 0,85$	QBC $\emptyset \emptyset \emptyset \emptyset^{**}$ $= 0,85$
☛ Calculation Principles			** combined with USS

Nominal Size			Ratings		Speed Limit		Seat Dimensions			Mass		
d	D	B	UKF Type		C ₀	C	n _{lim} RPM		r _a	d _a	D _a	m
mm					N	N	Grease lubrication	minimum oil lubrication	mm			kg
65	90	13	719 USSC 65		12100	16100	16800	25900	0,3	69,5	85,5	0,17
	90	26	719 USOC 65		24200	26250	16100	24500	0,3	69,5	85,5	0,35
	100	18	70 USSC 65		15620	22470	15400	24500	1,0	72,0	93,0	0,37
	100	36	70 USOC 65		31295	36400	14700	22400	1,0	72,0	93,0	0,72
70	100	16	719 USSC 70		15950	21000	15400	23800	0,3	75,5	94,5	0,28
	100	32	719 USOC 70		31900	34300	14000	22400	0,3	75,5	94,5	0,56
	110	20	70 USSC 70		20790	29400	14000	22400	1,0	78,0	102,0	0,51
	110	40	70 USOC 70		41525	48020	13300	21000	1,0	78,0	102,0	1,02
75	105	16	719 USSC 75		16775	21700	14000	22400	0,3	80,5	99,5	0,30
	105	32	719 USOC 75		33550	35350	13300	21000	0,3	80,5	99,5	0,60
	115	20	70 USSC 75		22000	30100	13300	21000	1,0	83,0	107,0	0,52
	115	40	70 USOC 75		44000	49700	12600	20300	1,0	83,0	107,0	1,15
80	110	16	719 USSC 80		17600	21700	13300	21000	0,3	85,5	104,5	0,32
	110	32	719 USOC 80		35200	35700	12600	20300	0,3	85,5	104,5	0,64
	125	22	70 USSC 80		27775	39970	12600	19600	1,0	89,0	116,0	0,74
	125	44	70 USOC 80		55550	64960	11900	18200	1,0	89,0	116,0	1,49
85	120	18	719 USSC 85		22825	28700	12600	19600	0,6	92,5	114,5	0,45
	120	36	719 USOC 85		45650	46900	11900	18900	0,6	92,5	114,5	0,89
	130	22	70 USSC 85		31625	42350	11900	18900	1,0	94,0	121,0	0,77
	130	44	70 USOC 85		63250	69160	11200	18200	1,0	94,0	121,0	1,53
90	125	18	719 USSC 90		23925	29680	11900	18900	0,6	96,5	118,5	0,49
	125	36	719 USOC 90		47850	48300	11200	18200	0,6	96,5	118,5	0,98
	140	24	70 USSC 90		37950	51800	11200	17500	1,2	100,0	130,0	0,98
	140	48	70 USOC 90		76450	84700	10500	16800	1,2	100,0	130,0	1,96
100	140	20	719 USSC 100		32450	38850	10500	16800	0,6	107,0	132,0	0,66
	140	40	719 USOC 100		65175	63000	9800	16100	0,6	107,0	132,0	1,33
	150	24	70 USSC 100		43175	55020	10500	16100	1,2	110,0	140,0	1,11
	150	48	70 USOC 100		86350	89250	9800	15400	1,2	110,0	140,0	2,21
110	150	20	719 USSC 110		34100	38500	9800	15400	0,6	117,0	143,0	0,72
	150	40	719 USOC 110		68200	63000	9100	14700	0,6	117,0	143,0	1,45
	170	28	70 USSC 110		55000	72100	9100	14000	1,2	122,0	158,0	1,70
	170	56	70 USOC 110		110000	116900	8400	13300	1,2	122,0	158,0	3,40
120	165	22	719 USSC 120		43175	48230	9100	14000	0,6	128,0	151,0	0,98
	165	44	719 USOC 120		86350	78400	8400	13300	0,6	128,0	151,0	1,96
	180	28	70 USSC 120		58850	73500	8400	12800	1,5	132,0	168,0	1,83
	180	56	70 USOC 120		118250	119700	8100	12600	1,5	132,0	168,0	3,66
130	180	24	719 USSC 130*		50875	58100	8400	13100	0,6	139,0	171,0	1,32
	180	48	719 USOC 130*		101750	93800	7700	12600	0,6	139,0	171,0	2,64
	200	33	70 USSC 130*		75130	95410	7800	12000	1,5	144,5	185,5	2,76
	200	66	70 USOC 130*		150150	154700	7000	11400	1,5	144,5	185,5	5,57
140	190	24	719 USSC 140*		55000	59850	7700	11900	0,6	148,5	181,5	1,38
	190	48	719 USOC 140*		110550	97300	7000	11200	0,6	148,5	181,5	2,77
	210	33	70 USSC 140*		80300	97300	7200	11200	1,5	154,5	195,5	2,98
	210	66	70 USOC 140*		161150	158200	6700	10500	1,5	154,5	195,5	5,95
150	210	28	719 USSC 150*		73150	80500	7000	11200	1,0	161,0	199,0	2,17
	210	56	719 USOC 150*		146575	130900	6300	10500	1,0	161,0	199,0	4,34
	225	35	70 USSC 150*		97900	122500	6700	10500	1,5	165,5	209,5	3,61
	225	70	70 USOC 150*		196350	198800	6100	10000	1,5	165,5	209,5	7,23

* upon request



Preload and Rigidity

UKF Spindle Bearings with Ceramic Balls (Hybrid Bearings)

Optimal Contact Angle $\alpha = 21^\circ$

Compared to 15°-Bearings, only slightly reduced Maximum Speed, but approximately 60 % higher Axial Rigidity !

Series 719/70 USSC, XH 719/70 USSC Single Row (paired in O- or X-Assembly), 719/70 USOC, XH 719/70


UKF Type				Axial Preload $F_V(N)$			Axial Rigidity $R_a(N/\mu m)$			Radial Rigidity $R_r(N/\mu m)$			
				CRONIDEX®-Steel		d	L	M	S	L	M	S	L
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	15	30 40	100 130	200 260	33 37	49 55	62 69	132 150	201 219	253 276
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	17	40 50	110 150	220 310	39 41	58 60	69 76	155 167	219 242	276 305
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	20	60 70	180 210	360 430	48 49	69 72	18 92	196 201	276 288	351 368
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	25	70 80	200 240	400 470	56 59	79 85	100 107	224 236	322 345	403 431
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	30	70 100	220 300	440 610	61 66	90 94	113 121	247 265	362 380	454 477
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	35	90 120	260 350	520 700	70 78	100 105	127 138	282 316	403 449	512 569
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	40	100 130	290 370	580 750	78 84	112 121	138 150	316 339	449 483	564 610
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	45	130 170	380 500	760 1010	91 95	132 138	161 173	368 385	523 552	656 702
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	50	130 180	400 530	800 1030	94 102	138 144	173 184	380 408	552 587	702 736
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	55	180 240	540 720	1040 1420	109 121	161 173	196 213	443 477	644 690	794 863
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	60	190 250	560 750	1120 1520	121 127	184 190	219 230	483 500	690 725	874 920
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	65	200 250	580 760	1160 1540	127 132	190 190	224 236	506 523	725 759	909 955
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	70	250 330	750 1000	1500 1940	138 150	201 213	253 270	558 598	805 863	1012 1081
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	75	260 340	780 1020	1560 2040	144 155	207 224	265 282	587 627	840 219	1058 1139
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	80	270 410	810 1260	1620 2520	150 161	219 236	276 293	610 656	874 943	1104 1196
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	85	320 430	960 1280	1920 2560	167 173	236 247	299 311	667 690	966 989	1208 1242
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	90	370 510	1100 1520	2200 3040	178 196	259 282	322 357	725 794	1035 1139	1311 1438
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	100	440 540	1320 1620	2640 3200	127 207	288 299	357 380	794 840	1150 1219	1449 1518
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	110	470 720	1420 2140	2840 4300	207 236	299 339	380 362	840 955	1208 1369	1530 1725
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	120	550 730	1650 2200	3300 4400	230 247	334 357	420 449	932 989	1346 1426	1691 1794
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	130	670 930	2020 2780	4040 5600	253 265	362 385	454 483	1012 1081	1461 1553	1840 1955
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	140	720 940	2160 2880	4320 5760	265 276	380 403	477 506	1058 1116	1530 1622	1932 2047
719 70	USSC / USOC USSC / USOC	719 70	XH USSC / USOC XH USSC / USOC	150	890 1100	2680 3240	5360 6440	288 299	414 426	518 535	1150 1196	1668 1714	2105 2162

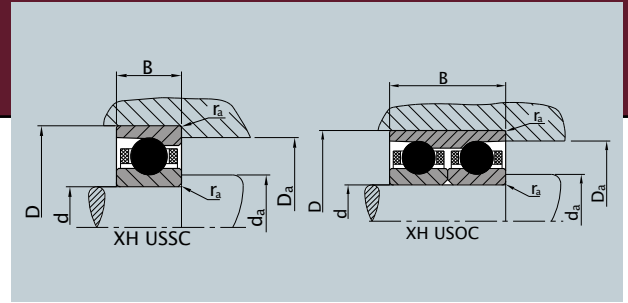


UKF Spindle Bearings of CRONIDEX® Steel with Ceramic Balls (“XH”-Hybrid Bearings)

Series XH 719 USSC, XH 719 USOC and XH 70 USSC, XH 70 USOC

Single/Double row, with fibre cage, preloaded, optimal contact angle, $\alpha = 21^\circ$; $15^\circ \dots 25^\circ$ upon request.

Calculation factors for Maximum Speed Limit (Precision, Preload, Configuration)
 Calculation Principles



Dimensions:

XH USSC comparable Single Row Bearings Series 719/70

XH USOC comparable to a pair Single Row Bearings 719/70

Nominal Size			UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass m kg
d	D	B		C ₀ N	C N	n _{lim} RPM		r _a	d _a	D _a	
mm					Grease lubrication minimum oil lubrication		mm				
15	28	7	XH 719 USSC 15	1820	6440	70400	107200	0,15	17,5	25,5	0,01
	28	14	XH 719 USOC 15	3570	10500	65600	102400	0,15	17,5	25,5	0,03
	32	9	XH 70 USSC 15	2520	8960	63200	97600	0,3	18,5	28,5	0,03
	32	18	XH 70 USOC 15	5040	14700	60000	92800	0,3	18,5	28,5	0,05
17	30	7	XH 719 USSC 17	1960	6720	64000	99200	0,15	19,5	27,5	0,02
	30	14	XH 719 USOC 17	3990	11060	60000	94400	0,15	19,5	27,5	0,03
	35	10	XH 70 USSC 17	2800	9520	57600	88000	0,3	21,0	31,0	0,04
	35	20	XH 70 USOC 17	5600	15400	54400	84800	0,3	21,0	31,0	0,07
20	37	9	XH 719 USSC 20	2590	8960	52800	81600	0,15	23,0	34,0	0,03
	37	18	XH 719 USOC 20	5250	14560	49600	76800	0,15	23,0	34,0	0,06
	42	12	XH 70 USSC 20	4480	15120	48000	73600	0,6	25,0	37,0	0,06
	42	24	XH 70 USOC 20	8960	24640	44800	70400	0,6	25,0	37,0	0,13
25	42	9	XH 719 USSC 25	3220	9660	44800	68800	0,15	28,0	39,0	0,04
	42	18	XH 719 USOC 25	6440	15680	42400	65600	0,15	28,0	39,0	0,07
	47	12	XH 70 USSC 25	5110	15820	41600	64000	0,6	30,0	42,0	0,07
	47	24	XH 70 USOC 25	10150	25760	38400	60800	0,6	30,0	42,0	0,14
30	47	9	XH 719 USSC 30	3850	10920	38400	60000	0,15	33,0	44,0	0,04
	47	18	XH 719 USOC 30	7700	17500	36800	57600	0,15	33,0	44,0	0,08
	55	13	XH 70 USSC 30	6930	20580	35200	54400	1,0	36,0	49,0	0,10
	55	26	XH 70 USOC 30	13860	33600	34400	51200	1,0	36,0	49,0	0,19
35	55	10	XH 719 USSC 35	5390	14420	33600	51200	0,3	39,5	50,5	0,07
	55	20	XH 719 USOC 35	10850	23380	31200	48800	0,3	39,5	50,5	0,13
	62	14	XH 70 USSC 35	9380	25760	31200	47200	1,0	41,5	55,5	0,13
	62	28	XH 70 USOC 35	18760	41580	29600	44800	1,0	41,5	55,5	0,26
40	62	12	XH 719 USSC 40	7350	18900	28800	44800	0,3	44,0	58,0	0,10
	62	24	XH 719 USOC 40	15050	30800	27200	43200	0,3	44,0	58,0	0,19
	68	15	XH 70 USSC 40	9520	25900	27200	41600	1,0	47,0	61,0	0,16
	68	30	XH 70 USOC 40	19040	42000	25600	40000	1,0	47,0	61,0	0,32
45	68	12	XH 719 USSC 45	8050	18900	26400	40000	0,3	49,5	63,5	0,11
	68	24	XH 719 USOC 45	16450	30800	24800	38400	0,3	49,5	63,5	0,23
	75	16	XH 70 USSC 45	13300	36120	24800	38400	1,0	51,5	68,5	0,21
	75	32	XH 70 USOC 45	27020	58800	23200	36800	1,0	51,5	68,5	0,42
50	72	12	XH 719 USSC 50	8400	19600	24800	38400	0,3	54,0	68,0	0,11
	72	24	XH 719 USOC 50	17150	32200	23200	36800	0,3	54,0	68,0	0,23
	80	16	XH 70 USSC 50	15400	38920	22400	35200	1,0	56,5	73,5	0,22
	80	32	XH 70 USOC 50	31010	63000	21600	33600	1,0	56,5	73,5	0,45
55	80	13	XH 719 USSC 55	13050	26600	22400	33600	0,3	59,5	75,5	0,16
	80	26	XH 719 USOC 55	26250	49000	20800	32000	0,3	59,5	75,5	0,32
	90	18	XH 70 USSC 55	16940	39480	20000	32000	1,0	62,0	83,0	0,33
	90	36	XH 70 USOC 55	33880	64400	19200	30400	1,0	62,0	83,0	0,67
60	85	13	XH 719 USSC 60	14700	31500	20800	32000	0,3	64,5	80,5	0,16
	85	26	XH 719 USOC 60	29750	51100	19200	30400	0,3	64,5	80,5	0,31
	95	18	XH 70 USSC 60	18760	43960	19200	29600	1,0	67,0	88,0	0,35
	95	36	XH 70 USOC 60	37590	71400	17600	28000	1,0	67,0	88,0	0,70

Bearing Sets and Calculation Factor f_3 for Speed Limit

single row	$\emptyset \emptyset$	$f_3 = 1,0$	double row, Type USO
DT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,95$	
DB	$\emptyset \emptyset \emptyset \emptyset$	$= 0,9$	DB $\emptyset \emptyset$ $= 1,0$
TBT	$\emptyset \emptyset \emptyset \emptyset$	$= 0,75$	TBT $\emptyset \emptyset \emptyset^{**}$ $= 0,9$
QBC	$\emptyset \emptyset \emptyset \emptyset$	$= 0,85$	QBC $\emptyset \emptyset \emptyset \emptyset^{**}$ $= 0,85$
☛ Calculation Principles			** combined with USS

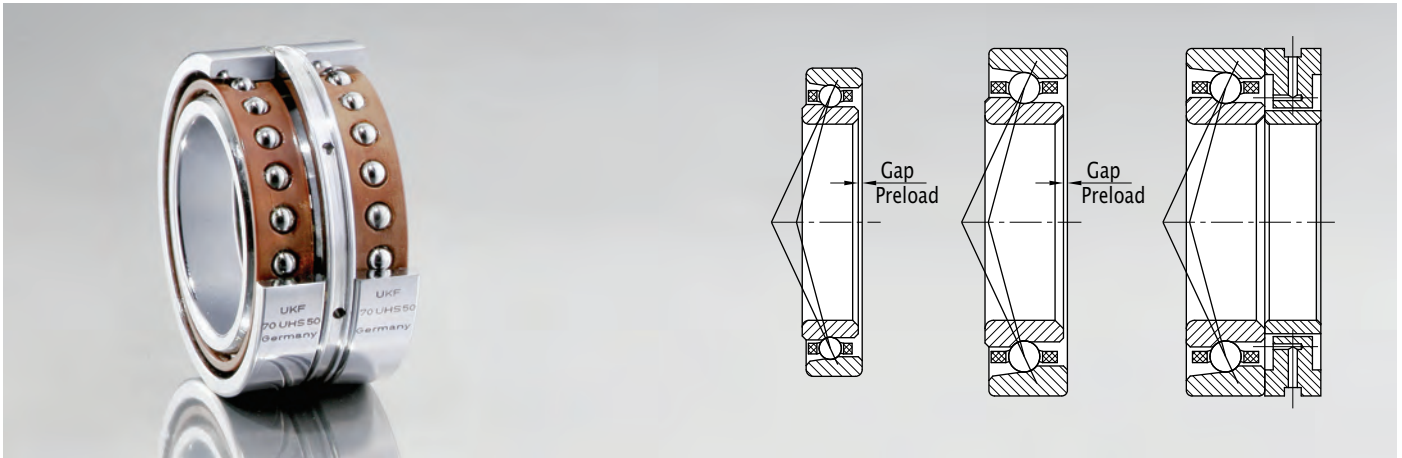
Nominal Size	UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass m kg	
		C_0 N	C N	n_{lim} RPM Grease lubrication	minimum oil lubrication	r_a	d_a mm	D_a		
65	90 13	XH 719 USSC 65	15400	32200	19200	29600	0,3	69,5	85,5	0,17
	90 26	XH 719 USOC 65	30800	52500	18400	28000	0,3	69,5	85,5	0,35
	100 18	XH 70 USSC 65	19880	44940	17600	28000	1,0	72,0	93,0	0,37
	100 36	XH 70 USOC 65	39830	72800	16800	25600	1,0	72,0	93,0	0,72
70	100 16	XH 719 USSC 70	20300	42000	17600	27200	0,3	75,5	94,5	0,28
	100 32	XH 719 USOC 70	40600	68600	16000	25600	0,3	75,5	94,5	0,56
	110 20	XH 70 USSC 70	26460	58800	16000	25600	1,0	78,0	102,0	0,51
	110 40	XH 70 USOC 70	52850	96040	15200	24000	1,0	78,0	102,0	1,02
75	105 16	XH 719 USSC 75	21350	43400	16000	25600	0,3	80,5	99,5	0,30
	105 32	XH 719 USOC 75	42700	70700	15200	24000	0,3	80,5	99,5	0,60
	115 20	XH 70 USSC 75	28000	60200	15200	24000	1,0	83,0	107,0	0,52
	115 40	XH 70 USOC 75	56000	99400	14400	23200	1,0	83,0	107,0	1,15
80	110 16	XH 719 USSC 80	22400	43400	15200	24000	0,3	85,5	104,5	0,32
	110 32	XH 719 USOC 80	44800	71400	14400	23200	0,3	85,5	104,5	0,64
	125 22	XH 70 USSC 80	35350	79940	14400	22400	1,0	89,0	116,0	0,74
	125 44	XH 70 USOC 80	70700	129920	13600	20800	1,0	89,0	116,0	1,49
85	120 18	XH 719 USSC 85	29050	57400	14400	22400	0,6	92,5	114,5	0,45
	120 36	XH 719 USOC 85	58100	93800	13600	21600	0,6	92,5	114,5	0,89
	130 22	XH 70 USSC 85	40250	84700	13600	21600	1,0	94,0	121,0	0,77
	130 44	XH 70 USOC 85	80500	138320	12800	20800	1,0	94,0	121,0	1,53
90	125 18	XH 719 USSC 90	30450	59360	13600	21600	0,6	96,5	118,5	0,49
	125 36	XH 719 USOC 90	60900	96600	12800	20800	0,6	96,5	118,5	0,98
	140 24	XH 70 USSC 90	48300	103600	12800	20000	1,2	100,0	130,0	0,98
	140 48	XH 70 USOC 90	97300	169400	12000	19200	1,2	100,0	130,0	1,96
100	140 20	XH 719 USSC 100	41300	77700	12000	19200	0,6	107,0	132,0	0,66
	140 40	XH 719 USOC 100	82950	126000	11200	18400	0,6	107,0	132,0	1,33
	150 24	XH 70 USSC 100	54950	110040	12000	18400	1,2	110,0	140,0	1,11
	150 48	XH 70 USOC 100	109900	178500	11200	17600	1,2	110,0	140,0	2,21
110	150 20	XH 719 USSC 110	43400	77000	11200	17600	0,6	117,0	143,0	0,72
	150 40	XH 719 USOC 110	86800	126000	10400	16800	0,6	117,0	143,0	1,45
	170 28	XH 70 USSC 110	70000	144200	10400	16000	1,2	122,0	158,0	1,70
	170 56	XH 70 USOC 110	140000	233800	9600	15200	1,2	122,0	158,0	3,40
120	165 22	XH 719 USSC 120	54950	96460	10400	16000	0,6	128,0	151,0	0,98
	165 44	XH 719 USOC 120	109900	156800	9600	15200	0,6	128,0	151,0	1,96
	180 28	XH 70 USSC 120	74900	147000	9600	14700	1,5	132,0	168,0	1,83
	180 56	XH 70 USOC 120	150500	239400	9200	14400	1,5	132,0	168,0	3,66
130	180 24	XH 719 USSC 130*	64750	116200	9600	15000	0,6	139,0	171,0	1,32
	180 48	XH 719 USOC 130*	129500	187600	8800	14400	0,6	139,0	171,0	2,64
	200 33	XH 70 USSC 130*	95620	190820	8900	13700	1,5	144,5	185,5	2,76
	200 66	XH 70 USOC 130*	191100	309400	8000	13100	1,5	144,5	185,5	5,57
140	190 24	XH 719 USSC 140*	70000	119700	8800	13600	0,6	148,5	181,5	1,38
	190 48	XH 719 USOC 140*	140700	194600	8000	12800	0,6	148,5	181,5	2,77
	210 33	XH 70 USSC 140*	102200	194600	8300	12800	1,5	154,5	195,5	2,98
	210 66	XH 70 USOC 140*	205100	316400	7600	12000	1,5	154,5	195,5	5,95
150	210 28	XH 719 USSC 150*	93100	161000	8000	12800	1,0	161,0	199,0	2,17
	210 56	XH 719 USOC 150*	186550	261800	7200	12000	1,0	161,0	199,0	4,34
	225 35	XH 70 USSC 150*	124600	245000	7600	12000	1,5	165,5	209,5	3,61
	225 70	XH 70 USOC 150*	249900	397600	7000	11500	1,5	165,5	209,5	7,23

* upon request



UKF High Speed Spindle Bearings

Series 719 UHS, 70 UHS



High Speed Spindle Bearings

For higher spindle speeds (HSC, HSM), bearings with smaller balls and profiles provide both reduced internal stresses due to the reduced centrifugal forces acting on the outer ring, and up to 40% higher maximum speeds. Conversely, total load capacity (C) is somewhat reduced. However, the resulting higher number of balls also yields increased rigidity, while the stronger cross-sections provide higher stability to both the inner and outer rings of the bearing.

Retainers are made of premium fibre, and fully capture and guide the bearing's balls. In turn, the retainer follows the inner edge of the outer ring. Retainers made of other materials, including PEEK, can also be furnished at extra cost, upon request. Also available, inner rings with one shoulder set back to facilitate lubricant feed and distribution (centrifugal effect).

*higher Speed Limits
and Rigidity,
modified Load Capacity,
stronger Cross-Sections*

For these high-speed bearings, the customary contact angle is 15°, but UKF also offers 25° for applications requiring higher axial stiffness. Other angles, ranging from 12° to 30° are also available.

Dimensions are in accordance with Series 719..., 70..., or the Dimensional Series 19, respectively 10, → Table "Bearing Seats". Bearings of the 719 Series feature smaller cross-sections allowing a larger diameter shaft to be used, while retaining the same housing dimensions. Bearings in accordance with the 718 Series are available upon specific inquiry and agreement.

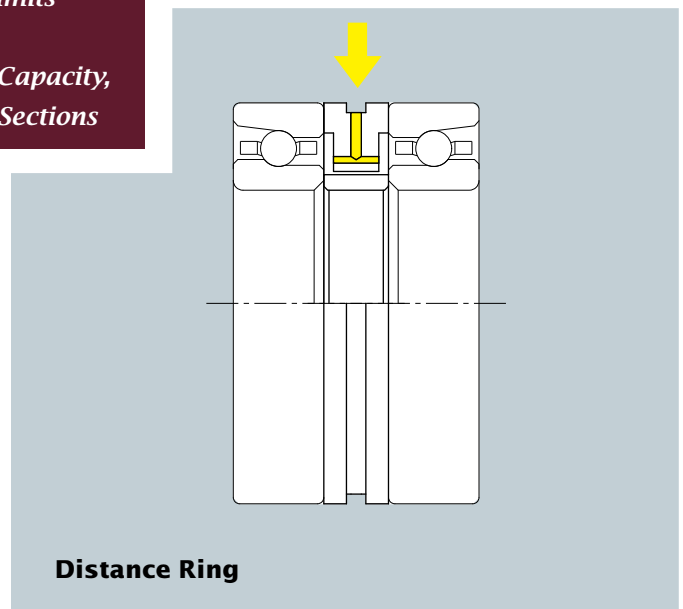
Distance rings, which are used as design and assembly elements to increase axial offset are also helpful in supplying lubricants to the bearings. In the case of grease lubrication, this can also serve as a reservoir for additional lubricant.

Options:

Lubrication feed, through the outer ring, directly into the raceway. → S. 26

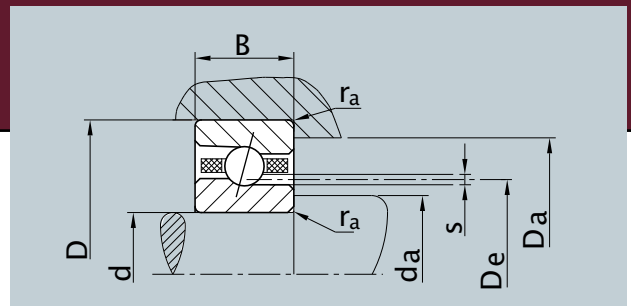
Bearings with integral shields → S. 26

Pre-lubricated bearings; packed with proven high-performance grease; filled with the exact quantity - so bearing is ready for installation → S. 46



Seat Dimensions for UKF High Speed Spindle Bearings

Series 719/70 UHS and 719/70 UHC,
also in accordance with Dimensional Series 19, 10



Dimensions and weights

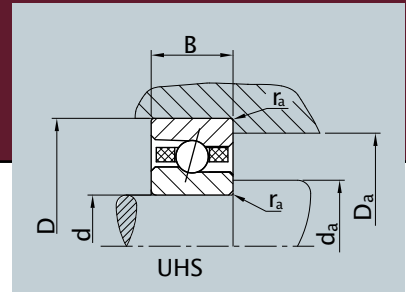
Nominal Size			UKF Type			Seat Dimensions					Mass	
d	D	B				D _e	s	r _a	d _a	D _a	kg	UHS
mm			mm									
20	37	9	719 70	UH. UH.	20	26,1	1,40	0,50	23,0	34,0	0,04	0,04
	42	12				28,3	1,75	0,80	25,0	37,0	0,08	0,07
25	42	9	719 70	UH. UH.	25	31,1	1,35	0,50	28,0	39,0	0,04	0,04
	47	12				33,3	1,75	0,80	30,0	42,0	0,09	0,08
30	47	9	719 70	UH. UH.	30	36,1	1,35	0,50	33,0	44,0	0,05	0,05
	55	13				39,2	1,90	1,30	36,0	49,0	0,12	0,11
35	55	10	719 70	UH. UH.	35	42,7	1,50	0,80	39,5	50,5	0,08	0,07
	62	14				44,6	1,90	1,30	41,5	55,5	0,16	0,15
40	62	12	719 70	UH. UH.	40	48,2	1,75	0,80	44,0	58,0	0,12	0,11
	68	15				50,7	1,90	1,30	47,0	61,0	0,19	0,18
45	68	12	719 70	UH. UH.	45	53,8	1,80	0,80	49,5	63,5	0,14	0,13
	75	16				56,0	2,00	1,30	51,5	68,5	0,26	0,24
50	72	12	719 70	UH. UH.	50	58,2	1,85	0,80	54,0	68,0	0,14	0,13
	80	16				61,0	2,00	1,30	56,5	73,5	0,27	0,25
55	80	13	719 70	UH. UH.	55	64,3	2,20	1,30	59,5	75,5	0,19	0,18
	90	18				68,2	2,35	1,40	62,0	83,0	0,41	0,38
60	85	13	719 70	UH. UH.	60	69,4	2,10	1,30	64,5	80,5	0,20	0,19
	95	18				73,3	2,45	1,40	67,0	88,0	0,44	0,41
65	90	13	719 70	UH. UH.	65	74,5	2,05	1,30	69,5	85,5	0,22	0,21
	100	18				78,3	2,45	1,40	72,0	93,0	0,46	0,43
70	100	16	719 70	UH. UH.	70	81,4	2,25	1,30	75,7	94,5	0,36	0,34
	110	20				84,7	2,90	1,40	78,0	102,0	0,65	0,61
75	105	16	719 70	UH. UH.	75	86,4	2,25	1,30	80,5	99,5	0,39	0,36
	115	20				89,7	2,90	1,40	83,0	107,0	0,72	0,67
80	110	16	719 70	UH. UH.	80	91,5	2,35	1,30	85,5	104,5	0,41	0,38
	125	22				96,8	3,25	1,40	89,0	116,0	0,94	0,88
85	120	18	719 70	UH. UH.	85	97,8	2,70	1,30	92,5	114,5	0,57	0,53
	130	22				101,9	3,25	1,40	94,0	121,0	0,97	0,91
90	125	18	719 70	UH. UH.	90	102,9	2,80	1,40	96,5	118,5	0,62	0,58
	140	24				109,0	3,60	1,80	100,0	130,0	1,24	1,16
100	140	20	719 70	UH. UH.	100	114,9	2,95	1,40	110,0	132,0	0,82	0,77
	150	24				119,0	3,60	1,80	110,0	140,0	1,40	1,31
110	150	20	719 70	UH. UH.	110	124,9	3,00	1,40	117,0	143,0	0,91	0,85
	170	28				132,6	4,55	2,40	122,0	158,0	2,16	2,02
120	165	22	719 70	UH. UH.	120	136,9	3,20	1,40	128,0	157,0	1,24	1,16
	180	28				142,6	4,37	2,40	132,0	168,0	2,32	2,17
130	180	24	719 70	UH. UH.	130	148,5	3,75	1,40	139,0	171,0	1,67	1,56
	200	33				156,3	5,35	2,40	144,5	185,5	3,51	3,28
140	190	24	719 70	UH. UH.	140	158,5	3,75	1,40	148,5	181,5	1,76	1,65
	210	33				166,3	5,35	2,40	154,5	195,5	3,78	3,53
150	210	28	719 70	UH. UH.	150	172,8	4,60	1,40	161,0	199,0	2,75	2,57
	225	35				177,9	6,00	2,40	165,5	209,5	4,59	4,29

*upon request



UKF High Speed Spindle Bearings

Series 719 UHS and 70 UHS



Single Row, with fibre cage,
preloaded,
Angle of Contact α : A15 = 15°, A25 = 25°

Calculation Factors for Speed Limit
(Precision, Preload, Configuration)

➤ Calculation Principles

Dimensions of Series 719/70

Nominal Size d D B mm	UKF Type	Ratings		Speed Limit		axial Preload L F _v N	Rigidity N/μm	
		C ₀ N	C N	n _{lim} RPM Grease lubrication	minimum oil lubrication		axial R _a	radial R _r
20 37 9 37 9 42 12 42 12	719 UHS 20 A15	2990	3390	46200	71400	40	21	145
	719 UHS 20 A25	2840	3220	39200	60600	65	56	128
	70 UHS 20 A15	5180	5720	42000	64400	50	24	160
	70 UHS 20 A25	4920	5430	35700	54700	80	64	141
25 42 9 42 9 47 12 47 12	719 UHS 25 A15	3720	3650	39200	60200	50	26	167
	719 UHS 25 A25	3530	3460	33300	51100	80	69	147
	70 UHS 25 A15	5910	5980	36400	56000	60	28	185
	70 UHS 25 A25	5610	5680	30900	47600	95	74	163
30 47 9 47 9 55 13 55 13	719 UHS 30 A15	4450	4130	33600	52500	60	31	200
	719 UHS 30 A25	4220	3920	28500	44600	95	82	176
	70 UHS 30 A15	7530	7790	30800	47600	70	33	215
	70 UHS 30 A25	7150	7400	26100	40400	110	87	189
35 55 10 55 10 62 14 62 14	719 UHS 35 A15	6230	5450	29400	44800	70	35	224
	719 UHS 35 A25	5910	5170	24900	38000	110	93	197
	70 UHS 35 A15	9960	9590	27300	41300	80	38	252
	70 UHS 35 A25	9460	9110	23200	35100	130	101	222
40 62 12 62 12 68 15 68 15	719 UHS 40 A15	8500	7150	25200	39200	80	38	256
	719 UHS 40 A25	8070	6790	21400	33300	130	101	225
	70 UHS 40 A15	11010	9800	23800	36400	90	40	262
	70 UHS 40 A25	10450	9310	20200	30900	145	106	231
45 68 12 68 12 75 16 75 16	719 UHS 45 A15	9310	7150	23100	35000	90	41	281
	719 UHS 45 A25	8840	6790	19600	29700	145	109	247
	70 UHS 45 A15	15390	13670	21700	33600	120	47	313
	70 UHS 45 A25	14620	12980	18400	28500	195	125	275
50 72 12 72 12 80 16 80 16	719 UHS 50 A15	9720	7420	21700	33600	100	44	296
	719 UHS 50 A25	9230	7040	18400	28500	165	117	260
	70 UHS 50 A15	17820	14730	19600	30800	130	50	325
	70 UHS 50 A25	16920	13990	16600	26100	210	133	286
55 80 13 80 13 90 18 90 18	719 UHS 55 A15	17410	10070	19600	29400	130	51	335
	719 UHS 55 A25	16530	9560	16600	24900	210	135	295
	70 UHS 55 A15	19600	14940	17500	28000	170	56	379
	70 UHS 55 A25	18620	14190	14800	23800	275	148	333
60 85 13 85 13 95 18 95 18	719 UHS 60 A15	17010	11920	18200	28000	140	55	363
	719 UHS 60 A25	16150	11320	15400	23800	230	146	319
	70 UHS 60 A15	21700	16640	16800	25900	180	60	394
	70 UHS 60 A25	20610	15800	14200	22000	295	159	347
65 90 13 90 13 100 18 100 18	719 UHS 65 A15	17820	12190	16800	25900	150	59	388
	719 UHS 65 A25	16920	11580	14200	14800	245	156	341
	70 UHS 65 A15	21850	16150	15400	20700	190	64	421
	70 UHS 65 A25	20750	15340	13000	17500	310	160	370
70 100 16 100 16 110 20 110 20	719 UHS 70 A15	23490	15900	15400	23800	170	64	424
	719 UHS 70 A25	22310	15100	13000	20200	275	160	373
	70 UHS 70 A15	30610	22260	14000	22400	230	71	472
	70 UHS 70 A25	29070	21140	11900	19000	375	188	415

The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	$\emptyset \emptyset$	$\emptyset \emptyset$	$f_3 = 1,0$
DT	$\emptyset \emptyset$	$\emptyset \emptyset$	$= 0,95$
DB	$\emptyset \emptyset$	$\emptyset \emptyset$	$= 0,9$
TBT	$\emptyset \emptyset \emptyset$	$\emptyset \emptyset$	$= 0,75$
QBC	$\emptyset \emptyset \emptyset \emptyset$	$\emptyset \emptyset$	$= 0,85$
☛ Calculation Principles			

Single Row, with fibre cage,
preloaded,

Contact Angle α : A15 = 15°, A25 = 25°

Dimensions of Series 719/70

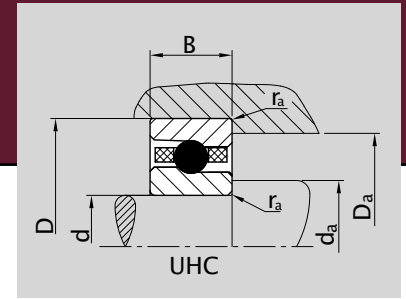
Nominal Size			UKF Type				Ratings		Speed Limit		axial Preload L	Rigidity N/ μ m	
d	D	B					C_0	C	n_{lim} RPM		F_v N	axial R_a	radial R_r
mm							N	N	Grease lubrication	minimum oil lubrication			
75	105	16	719 UHS 75 A15				24700	16430	14000	22400	180	67	448
	105	16	719 UHS 75 A25				23460	15600	11900	19000	295	178	394
	115	20	70 UHS 75 A15				32400	22790	13300	21000	240	74	488
	115	20	70 UHS 75 A25				30780	21650	11300	17800	390	196	429
80	110	16	719 UHS 80 A15				25920	16430	13300	21000	190	72	471
	110	16	719 UHS 80 A25				24620	15600	11300	17800	310	191	414
	125	22	70 UHS 80 A15				40900	30260	12600	19600	290	82	545
	125	22	70 UHS 80 A25				38850	28740	10700	16600	475	217	480
85	120	18	719 UHS 85 A15				33610	21730	12600	19600	220	77	511
	120	18	719 UHS 85 A25				31920	20640	10700	16600	360	204	450
	130	22	70 UHS 85 A15				46570	32060	11900	18900	300	85	564
	130	22	70 UHS 85 A25				44240	30450	10100	16000	490	225	496
90	125	18	719 UHS 90 A15				35230	22470	11900	18900	260	83	554
	125	18	719 UHS 90 A25				33460	21340	10100	16000	425	220	488
	140	24	70 UHS 90 A15				55890	39220	11200	17500	360	94	633
	140	24	70 UHS 90 A25				53090	37250	9500	14800	585	249	557
100	140	20	719 UHS 100 A15				47790	29410	10500	16800	310	91	610
	140	20	719 UHS 100 A25				45400	27930	8900	14200	505	241	537
	150	24	70 UHS 100 A15				63580	41650	10500	16100	380	100	664
	150	24	70 UHS 100 A25				60400	39560	8900	13600	620	265	684
110	150	20	719 UHS 110 A15				50220	29150	9800	15400	330	100	657
	150	20	719 UHS 110 A25				47700	27690	8300	13000	535	265	578
	170	28	70 UHS 110 A15				81000	54590	9100	14000	500	113	741
	170	28	70 UHS 110 A25				76950	51860	7700	11900	815	299	652
120	165	22	719 UHS 120 A15				63580	36510	9100	14000	390	109	729
	165	22	719 UHS 120 A25				60400	34680	7700	11900	635	289	642
	180	28	70 UHS 120 A15				86670	55650	8400	12800	510	120	785
	180	28	70 UHS 120 A25				82330	52860	7100	10800	830	318	691
130	180	24	719 UHS 130 A15*				74920	43990	8400	13100	470	119	784
	180	24	719 UHS 130 A25*				71170	41790	7100	11100	765	315	690
	200	33	70 UHS 130 A15*				110640	72230	7800	12000	650	133	876
	200	33	70 UHS 130 A25*				105100	68610	6600	10200	1060	352	771
140	190	24	719 UHS 140 A15*				81000	45310	7700	11900	500	124	815
	190	24	719 UHS 140 A25*				76950	43040	6500	10100	815	329	717
	210	33	70 UHS 140 A15*				118260	73670	7200	11200	660	136	903
	210	33	70 UHS 140 A25*				112340	69980	6100	9500	1070	360	795
150	210	28	719 UHS 150 A15*				107730	60950	7000	11200	620	140	929
	210	28	719 UHS 150 A25*				102340	57900	5900	9500	1010	371	818
	225	35	70 UHS 150 A15*				178000	92750	6700	10500	770	146	970
	225	35	70 UHS 150 A25*				169100	88110	5600	8900	1250	387	854

* upon request

The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

UKF High Speed Spindle Bearings with Ceramic Balls (Hybrid-Bearings)

Series 719 UHC and 70 UHC



Single Row, with fibre cage,
preloaded,
Contact Angle α : A15 = 15°, A25 = 25°

Calculation Factors for Speed Limit
(Precision, Preload, Configuration)

• Calculation Principles

Dimensions of Series 719/70

Nominal Size			UKF Type				Ratings		Speed Limit		axial Preload L	Rigidity N/ μ m	
d	D	B					C ₀	C	n _{lim} RPM	F _v N	R _a	R _r	
mm							N	N	Grease lubrication	minimum oil lubrication			
20	37	9	719	UHC	20	A15	1620	2360	54700	84600	40	24	167
	37	9	719	UHC	20	A25	1530	2240	46400	71900	65	64	147
	42	12	70	UHC	20	A15	2810	3990	49800	76300	50	28	184
	42	12	70	UHC	20	A25	2660	3790	42300	64800	80	74	162
25	42	9	719	UHC	25	A15	2020	2550	46400	71300	50	30	192
	42	9	719	UHC	25	A25	1910	2420	39400	60600	80	79	169
	47	12	70	UHC	25	A15	3210	4180	43100	66400	60	32	213
	47	12	70	UHC	25	A25	3040	3970	36600	56400	95	85	187
30	47	9	719	UHC	30	A15	2420	2880	39800	62200	60	36	230
	47	9	719	UHC	30	A25	2290	2730	33800	52800	95	94	202
	55	13	70	UHC	30	A15	4090	5430	36500	56400	70	38	247
	55	13	70	UHC	30	A25	3880	5150	31000	47900	110	100	217
35	55	10	719	UHC	35	A15	3380	3810	34800	53100	70	40	258
	55	10	719	UHC	35	A25	3210	3610	29500	45100	110	107	227
	62	14	70	UHC	35	A15	5410	6690	32300	48900	80	44	290
	62	14	70	UHC	35	A25	5130	6350	27400	41500	130	116	255
40	62	12	719	UHC	40	A15	4620	4990	29800	46400	80	44	294
	62	12	719	UHC	40	A25	4380	4740	25300	39400	130	116	259
	68	15	70	UHC	40	A15	5980	6840	28200	43100	90	46	301
	68	15	70	UHC	40	A25	5680	6490	23900	36600	145	122	266
45	68	12	719	UHC	45	A15	5060	4990	27300	41500	90	47	323
	68	12	719	UHC	45	A25	4800	4740	23200	35200	145	125	284
	75	16	70	UHC	45	A15	8360	9540	25700	39800	120	54	360
	75	16	70	UHC	45	A25	7940	9060	21800	33800	195	144	316
50	72	12	719	UHC	50	A15	5280	5180	25700	39800	100	51	340
	72	12	719	UHC	50	A25	5010	4920	21800	33800	165	135	299
	80	16	70	UHC	50	A15	9680	10280	23200	36500	130	58	374
	80	16	70	UHC	50	A25	9190	9760	19700	31000	210	153	329
55	80	13	719	UHC	55	A15	9460	7030	23200	34800	130	59	385
	80	13	719	UHC	55	A25	8980	6670	19700	29500	210	155	339
	90	18	70	UHC	55	A15	10640	10430	20700	33200	170	64	436
	90	18	70	UHC	55	A25	10100	9900	17500	28200	275	170	383
60	85	13	719	UHC	60	A15	9240	8320	21500	33200	140	63	417
	85	13	719	UHC	60	A25	8770	7900	18200	28200	230	168	367
	95	18	70	UHC	60	A15	11790	11610	19900	30700	180	69	453
	95	18	70	UHC	60	A25	11200	11020	16900	26000	295	183	399
65	90	13	719	UHC	65	A15	9680	8510	19900	30700	150	68	446
	90	13	719	UHC	65	A25	9190	8080	16900	26000	245	179	392
	100	18	70	UHC	65	A15	12490	11870	18200	28200	190	74	484
	100	18	70	UHC	65	A25	11860	11270	15400	23900	310	184	426
70	100	16	719	UHC	70	A15	12760	11100	18200	28200	170	74	488
	100	16	719	UHC	70	A25	12120	10540	15400	23900	275	184	429
	110	20	70	UHC	70	A15	16630	15540	16600	26500	230	82	543
	110	20	70	UHC	70	A25	15790	14760	14100	21100	375	216	477

The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	\emptyset	\emptyset	$f_3 = 1,0$
DT	$\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,95$
DB	$\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,9$
TBT	$\emptyset\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,75$
QBC	$\emptyset\emptyset\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,85$
☛ Calculation Principles			

Single Row, with fibre cage,
preloaded,

Contact Angle α : A15 = 15°, A25 = 25°

Dimensions of Series 719/70

Nominal Size			UKF Type				Ratings		Speed Limit		axial Preload L	Rigidity N/ μ m	
d	D	B					C ₀	C	n _{lim} RPM		F _v N	R _a	R _r
mm							N	N	Grease lubrication	minimum oil lubrication			
75	105	16	719 UHC 75 A15				13420	11470	16600	26500	180	77	515
	105	16	719 UHC 75 A25				12740	10890	14100	22500	295	205	453
	115	20	70 UHC 75 A15				17600	15910	15700	24900	240	85	561
	115	20	70 UHC 75 A25				16720	15110	13300	21100	390	225	493
80	110	16	719 UHC 80 A15				14080	11470	15700	24900	190	83	542
	110	16	719 UHC 80 A25				13370	10890	13300	21100	310	220	476
	125	22	70 UHC 80 A15				22220	21120	14900	23200	290	94	627
	125	22	70 UHC 80 A25				21100	20060	12600	19700	475	250	552
85	120	18	719 UHC 85 A15				18260	15170	14900	23200	220	89	588
	120	18	719 UHC 85 A25				17340	14410	12600	19700	360	235	518
	130	22	70 UHC 85 A15				25300	22380	14100	22400	300	98	649
	130	22	70 UHC 85 A25				24030	21260	11900	19000	490	259	570
90	125	18	719 UHC 90 A15				19140	15680	14100	22400	260	95	637
	125	18	719 UHC 90 A25				18180	14890	11900	19000	425	253	561
	140	24	70 UHC 90 A15				30360	27380	13200	20700	360	108	728
	140	24	70 UHC 90 A25				28840	26010	11200	17500	585	286	641
100	140	20	719 UHC 100 A15				25960	20530	12400	19900	310	105	702
	140	20	719 UHC 100 A25				24660	19500	10500	16900	505	277	618
	150	24	70 UHC 100 A15				34540	29080	12400	19000	380	115	764
	150	24	70 UHC 100 A25				32810	27620	10500	16100	620	305	672
110	150	20	719 UHC 110 A15				27280	20350	11600	18200	330	115	756
	150	20	719 UHC 110 A25				25910	19330	9800	15400	535	305	665
	170	28	70 UHC 110 A15				44000	38110	10700	16600	500	130	852
	170	28	70 UHC 110 A25				41800	36200	9000	14100	815	344	750
120	165	22	719 UHC 120 A15				34540	25490	10700	16600	390	125	838
	165	22	719 UHC 120 A25				32810	24210	9000	14100	635	332	738
	180	28	70 UHC 120 A15				47080	38850	9900	15200	sio	138	903
	180	28	70 UHC 120 A25				44720	36900	8400	12900	830	366	795
130	180	24	719 UHC 130 A15*				40700	30710	9900	15600	470	137	902
	180	24	719 UHC 130 A25*				38660	29170	8400	13200	765	362	794
	200	33	70 UHC 130 A15*				60100	50430	9200	14200	650	153	1007
	200	33	70 UHC 130 A25*				57090	47900	7800	12000	1060	405	887
140	190	24	719 UHC 140 A15*				44000	31630	9100	14100	500	143	937
	190	24	719 UHC 140 A25*				41800	30040	7700	11900	815	378	825
	210	33	70 UHC 140 A15*				64240	51430	8600	13200	660	156	1038
	210	33	70 UHC 140 A25*				61020	48850	7300	11200	1070	414	914
150	210	28	719 UHC 150 A15*				58520	42550	8300	13200	620	161	1068
	210	28	719 UHC 150 A25*				55590	40420	7000	11200	1010	427	941
	225	35	70 UHC 150 A15*				78320	64750	7900	12400	770	168	1116
	225	35	70 UHC 150 A25*				74400	61510	6700	10500	1250	445	982

* upon request

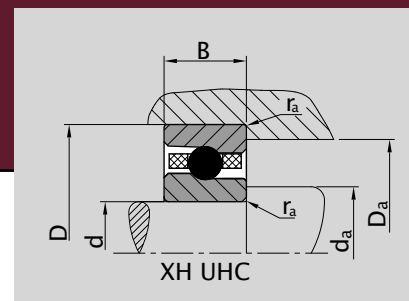
The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

UKF-High Speed Spindle Bearings of CRONIDEX® Steel with Ceramic Balls (XH Hybrid Bearings)

Series XH 719 UHC and XH 70 UHC

Single Row, with fibre cage,
preloaded,
Contact Angle α : A15 = 15°, A25 = 25°

Calculation Factors for Speed Limit
(Precision, Preload, Configuration)
• Calculation Principles



Dimensions of Series 719/70

Nominal Size			UKF Type				Ratings		Speed Limit		axial Preload L	Rigidity N/ μ m	
d	D	B					C ₀	C	n _{lim} RPM		F _v N	R _a	R _r
mm							N	N	Grease lubrication	minimum oil lubrication			
20	37	9	XH 719	UHC	20	A15	2100	4730	62700	96900	40	24	167
	37	9	XH 719	UHC	20	A25	1990	4490	53200	82300	65	64	147
	42	12	XH 70	UHC	20	A15	3640	7990	57000	87400	50	28	184
	42	12	XH 70	UHC	20	A25	3450	7590	48400	74200	80	74	162
25	42	9	XH 719	UHC	25	A15	2620	5100	53200	81700	50	30	192
	42	9	XH 719	UHC	25	A25	2480	4840	45200	69400	80	79	169
	47	12	XH 70	UHC	25	A15	4160	8360	49400	76000	60	32	213
	47	12	XH 70	UHC	25	A25	3950	7940	41900	64600	95	85	187
30	47	9	XH 719	UHC	30	A15	3130	5770	45600	71200	60	36	230
	47	9	XH 719	UHC	30	A25	2970	5480	38700	60500	95	94	202
	55	13	XH 70	UHC	30	A15	5300	10870	41800	64600	70	38	247
	55	13	XH 70	UHC	30	A25	5030	10320	35500	54900	110	100	217
35	55	10	XH 719	UHC	35	A15	4380	7620	39900	60800	70	40	258
	55	10	XH 719	UHC	35	A25	4160	7230	33900	51600	110	107	227
	62	14	XH 70	UHC	35	A15	7010	13390	37000	56000	80	44	290
	62	14	XH 70	UHC	35	A25	6650	12720	31400	47600	130	116	255
40	62	12	XH 719	UHC	40	A15	5980	9990	34200	53200	80	44	294
	62	12	XH 719	UHC	40	A25	5680	9490	29000	45200	130	116	259
	68	15	XH 70	UHC	40	A15	7750	13690	32300	49400	90	46	301
	68	15	XH 70	UHC	40	A25	7360	13000	27400	41900	145	122	266
45	68	12	XH 719	UHC	45	A15	6550	9990	31300	47500	90	47	323
	68	12	XH 719	UHC	45	A25	6220	9490	26600	40300	145	125	284
	75	16	XH 70	UHC	45	A15	10830	19090	29400	45600	120	54	360
	75	16	XH 70	UHC	45	A25	10280	18130	24900	38700	195	144	316
50	72	12	XH 719	UHC	50	A15	6840	10360	29400	45600	100	51	340
	72	12	XH 719	UHC	50	A25	6490	9840	24900	38700	165	135	299
	80	16	XH 70	UHC	50	A15	12540	20570	26600	41800	130	58	374
	80	16	XH 70	UHC	50	A25	11910	19540	22600	35500	210	153	329
55	80	13	XH 719	UHC	55	A15	12250	14060	26600	39900	130	59	385
	80	13	XH 719	UHC	55	A25	11630	13350	22600	33900	210	155	339
	90	18	XH 70	UHC	55	A15	13790	20860	23700	38000	170	64	436
	90	18	XH 70	UHC	55	A25	13100	19810	20100	32300	275	170	383
60	85	13	XH 719	UHC	60	A15	11970	16650	24700	38000	140	63	417
	85	13	XH 719	UHC	60	A25	11370	15810	20900	32300	230	168	367
	95	18	XH 70	UHC	60	A15	15270	23230	22800	35100	180	69	453
	95	18	XH 70	UHC	60	A25	14500	22060	19300	29800	295	183	399
65	90	13	XH 719	UHC	65	A15	12540	17020	22800	35100	150	68	446
	90	13	XH 719	UHC	65	A25	11910	16160	19300	29800	245	179	392
	100	18	XH 70	UHC	65	A15	16180	11950	20900	33200	190	74	484
	100	18	XH 70	UHC	65	A25	15370	11350	17700	28200	310	184	426
70	100	16	XH 719	UHC	70	A15	16530	22200	20900	32300	170	74	488
	100	16	XH 719	UHC	70	A25	15700	21090	17700	27400	275	184	429
	110	20	XH 70	UHC	70	A15	21540	31080	18000	30400	230	82	543
	110	20	XH 70	UHC	70	A25	20460	29520	16100	25800	375	216	477

The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	\emptyset	\emptyset	$f_3 = 1,0$
DT	$\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,95$
DB	$\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,9$
TBT	$\emptyset\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,75$
QBC	$\emptyset\emptyset\emptyset\emptyset$	$\emptyset\emptyset$	$= 0,85$
☛ Calculation Principles			

Single Row, with fibre cage,
preloaded,

Contact Angle α : A15 = 15°, A25 = 25°

Dimensions of Series 719/70

Nominal Size d	D mm	B	UKF Type	Ratings		Speed Limit		axial Preload L F _v N	Rigidity N/μm	
				C₀ N	C N	n_{lim} RPM Grease lubrication	minimum oil lubrication		axial R _a	radial R _r
75	105	16	XH 719 UHC 75 A15	17380	22940	19000	30400	180	77	515
	105	16	XH 719 UHC 75 A25	16510	21790	16100	25800	295	205	453
	115	20	XH 70 UHC 75 A15	22800	31820	18000	28500	240	85	561
	115	20	XH 70 UHC 75 A25	21660	30220	15300	24200	390	225	493
80	110	16	XH 719 UHC 80 A15	18240	22940	18000	28500	190	83	542
	110	16	XH 719 UHC 80 A25	17320	21790	15300	24200	310	220	476
	125	22	XH 70 UHC 80 A15	28780	42250	17100	26600	290	94	627
	125	22	XH 70 UHC 80 A25	27340	40130	14500	22600	475	250	552
85	120	18	XH 719 UHC 85 A15	23650	30340	17100	26600	220	89	588
	120	18	XH 719 UHC 85 A25	22460	28820	14500	22600	360	235	518
	130	22	XH 70 UHC 85 A15	32770	44770	16100	25600	300	98	649
	130	22	XH 70 UHC 85 A25	31130	42530	13600	21700	490	259	570
90	125	18	XH 719 UHC 90 A15	24790	31370	16100	25600	260	95	637
	125	18	XH 719 UHC 90 A25	23550	29800	13600	21700	425	253	561
	140	24	XH 70 UHC 90 A15	39330	54760	15200	23700	360	108	728
	140	24	XH 70 UHC 90 A25	37360	52020	12900	20100	585	286	641
100	140	20	XH 719 UHC 100 A15	33630	41070	14200	22800	310	105	702
	140	20	XH 719 UHC 100 A25	31940	39010	12000	19300	505	277	618
	150	24	XH 70 UHC 100 A15	44740	58160	14200	21800	380	115	764
	150	24	XH 70 UHC 100 A25	42500	55250	12000	18500	620	305	672
110	150	20	XH 719 UHC 110 A15	35340	40700	13300	20900	330	115	756
	150	20	XH 719 UHC 110 A25	33570	38660	11300	17700	535	305	665
	170	28	XH 70 UHC 110 A15	57000	76220	12300	19000	500	130	852
	170	28	XH 70 UHC 110 A25	54150	72400	10400	16100	815	344	750
120	165	22	XH 719 UHC 120 A15	44740	50980	12300	19000	390	125	838
	165	22	XH 719 UHC 120 A25	42500	48430	10400	16100	635	332	738
	180	28	XH 70 UHC 120 A15	60990	77700	11400	17400	510	138	903
	180	28	XH 70 UHC 120 A25	57940	73810	9600	14700	830	366	795
130	180	24	XH 719 UHC 130 A15*	52720	61420	11400	17800	470	137	902
	180	24	XH 719 UHC 130 A25*	50080	58340	9600	15100	765	362	794
	200	33	XH 70 UHC 130 A15*	77860	100860	10600	16300	650	153	1007
	200	33	XH 70 UHC 130 A25*	73960	95810	9000	13800	1060	405	887
140	190	24	XH 719 UHC 140 A15*	57000	63270	10400	16100	500	143	937
	190	24	XH 719 UHC 140 A25*	54150	60100	8800	13600	815	378	825
	210	33	XH 70 UHC 140 A15*	83220	102860	9800	15200	660	156	1038
	210	33	XH 70 UHC 140 A25*	79050	97710	8300	12900	1070	414	914
150	210	28	XH 719 UHC 150 A15*	75810	85100	9500	15200	620	161	1068
	210	28	XH 719 UHC 150 A25*	72010	80840	8000	12900	1010	427	941
	225	35	XH 70 UHC 150 A15*	101460	129500	9100	14200	770	168	1116
	225	35	XH 70 UHC 150 A25*	96380	123020	7700	12000	1250	445	982

*upon request

The values of preload and rigidity are for mounted pairs of bearings in O- or X-configuration, shaft fit is js4, housing fit is JS5; values for other preloads upon request.

UKF Spindle Bearings – Options

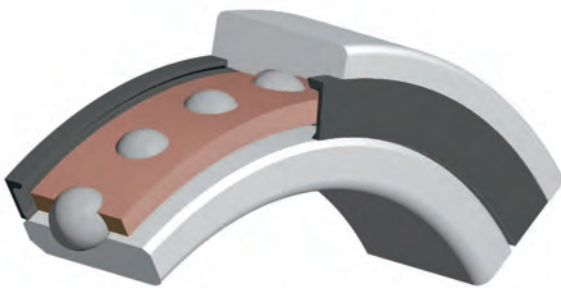
Type 718

Bearings in accordance with these dimensions are available on special order, and are subject to minimum order requirements.

Shields

Certain bearings are available with optional, factory-installed shields. These bearings are also pre-lubricated with the appropriate type and quantity of grease, and are ready for installation. In general, these bearings need no additional lubricants during their service life. Shields are provided on both sides, and are fixed in the Outer Ring. The shields are made of a special, exceptionally stable plastic, which is resistant to most lubricants and against temperatures up to 80°C (180°F). The shields are non-contacting with the Inner Ring, and do not add any friction load to the bearing.

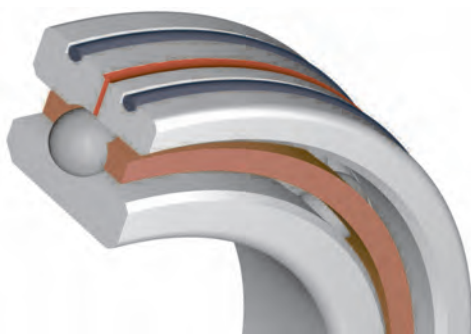
Shield designation: "ZZ", for ex. 719 UHC 50.A15.ZZ.O/I.L



Lubrication

As an alternative to an axial lubricant supply using, for example a distance ring (→ Distance Ring), lubricant can be supplied radially, directly through the Outer Ring into the raceway.

The bearing is specially configured with an annular groove in the Outer Ring, which distributes the lubricant to several radial bores. Additional grooves for O-ring seals are provided to prevent unwanted lubricant migration. Lubricant feed designator: "LB" (lubrication bore), for ex. 719 UHS 50.A15.LB.O/I.L

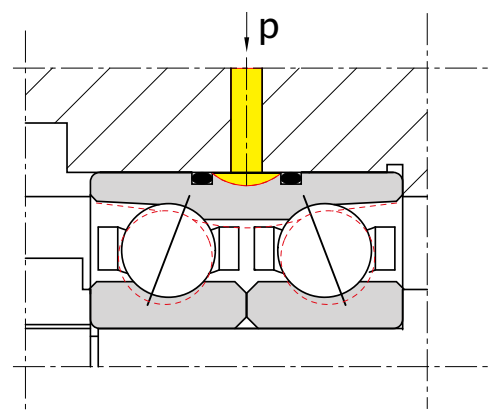
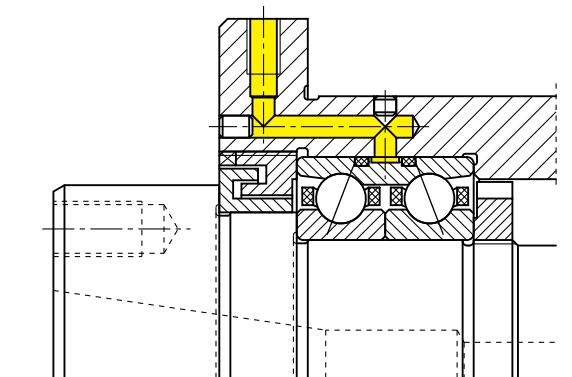


Variable Preload

A bearing's preload determines both the performance of the spindle, as well as the quality of the product. Heavy preloads increase the rigidity of the bearing set; light preloads enable higher operating speeds.

On modern Machine Tools, especially Machining Centres, expanded speed ranges are often required to meet productivity expectations. So, on the one hand, high rigidity for the working forces is required, on the other hand high speeds for efficient High Speed Cutting is needed.

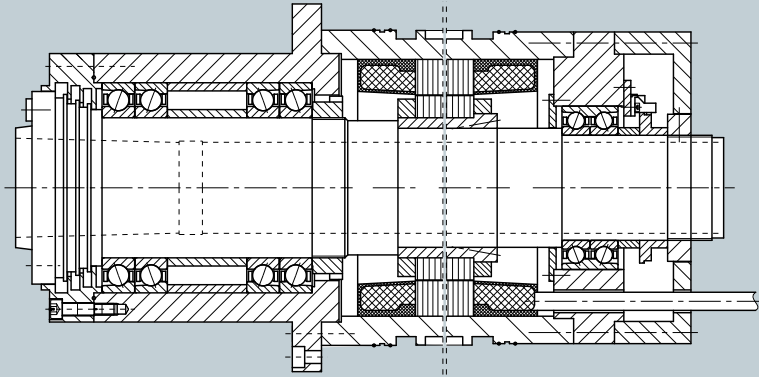
The UKF VARIORING System varies the preload of a bearing from "light" to "medium" and "heavy". This permits the highest possible RPM, or high rigidity (stiffness), respectively, corresponding to the varying requirements of the metal cutting operation. Only with bearings, whose preload can be dynamically altered during operation, can a process or operation be fully optimized. Starting point is normally a light preload.



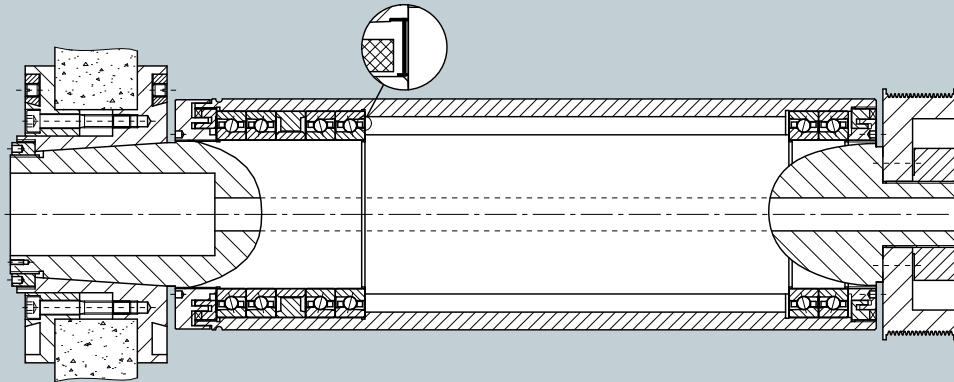
UKF System VARIORING

Hydraulic pressure is applied to a groove machined into the outer ring of the bearing. Parallel O-ring grooves seal the housing against the bearing ring, so that pressure can be used to increase or decrease the effective fit, and internal clearances of the bearing. The feature is applicable to any normal, double-row Spindle Bearing; usually with light preload. No additional parts; no axial displacement of the shaft.

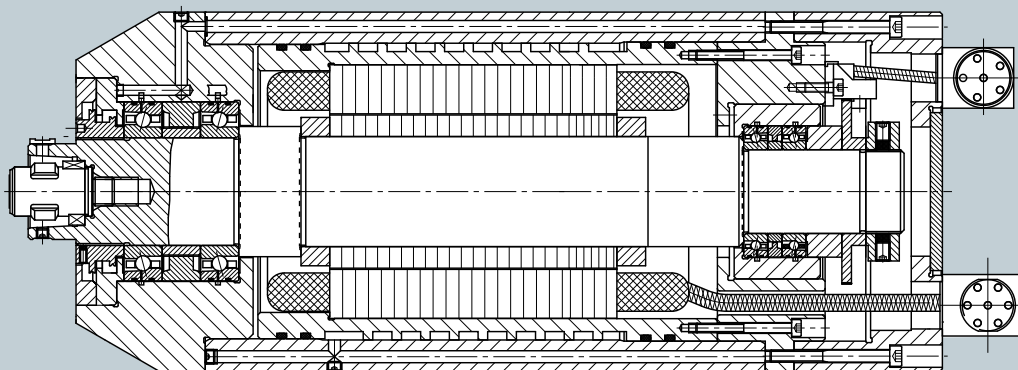
Design Examples



High Frequency Turning Spindle designed with Spindle Bearings USS and USO



Surface Grinding Spindle using sealed High Speed Spindle Bearings UHS "2Z"

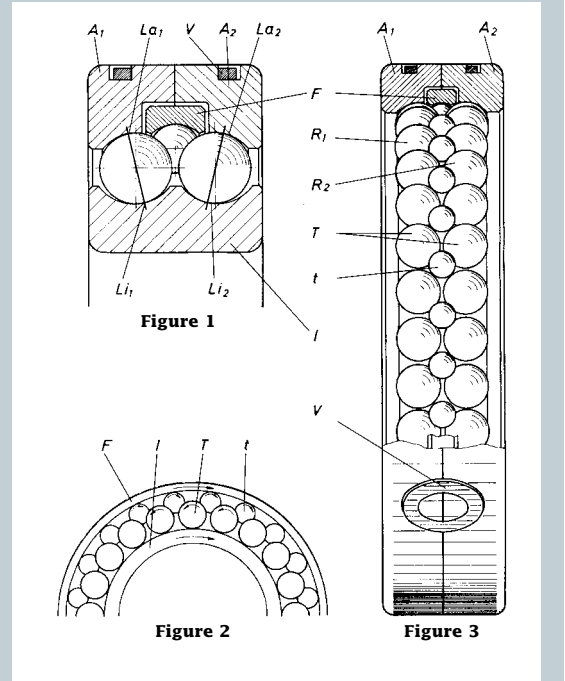


HSC-Spindle fitted with Spindle Bearings designed for direct lubrication "LB"

UKF Spindle Bearings with Spacer Balls (rolling ball guidance) double row, preloaded – Series K, UK, UL, UM



Bearings K/UK: in accordance with Series 70
 Bearings UL: in accordance with Series 72
 Bearings UM: in accordance with Series 73



Form factor according to DIN 628 part 5

Rolling contact without sliding friction

Between the two rows of load carrying balls, a third row of smaller Spacer- or Guide-Balls, roll on a separate internal bearing ring. The result is a bearing with only rolling friction at the load carrying balls—no tribologically adverse sliding friction resulting from a rigid cage! The space-saving effect of this unique design enables two rows of balls to occupy the same space as a comparably sized, single row bearing, e. g., a series 72, but with even more balls in a row!

Load Capacity and Lifetime

These bearings carry both radial and axial loads, and provide spherical contact of the balls (DF). This configuration provides a slight self-aligning preload; consequently, the balls remain under equal preload. The full ball complement also provides more load carrying points for improved load capacity and lifetime.

Fig. 1: The inner ring has two races, Li_1 and Li_2 ; similarly, La_1 and La_2 , are the outer races, formed by two rings, A_1 and A_2 , which are locked together by the security rings, V , fitted into machined grooves.

Fig. 2: When the inner ring rotates in direction of the arrow, the load carrying balls, T , follow in the same direction and rotate as shown in the figure. In this example, the Spacer Balls, t , respectively, revolve around their axis as shown, due to their contact with the load-carrying balls. Similarly, the Guidance Ring, F , follows the guide balls, as shown.

*Reliable precision over a long lifetime,
 many load carrying balls,
 ideal Spindle Bearing for headstocks*

Fig. 3: The load-carrying balls, T , are configured in two parallel raceways (R_1 and R_2). However, instead of a rigid retainer, a third row of Spacer Balls simultaneously, Guide Balls, t maintains separation and guides the load carrying balls. The independently rotating Guidance ring, F , encompasses the Spacer Balls and provides a preload. The design is **self-compensating, maintaining the preload of the bearings!**

The design is resistant to both the causes and the effects of wear. The bearings are factory preloaded, and are ready for installation without any further adjustment.

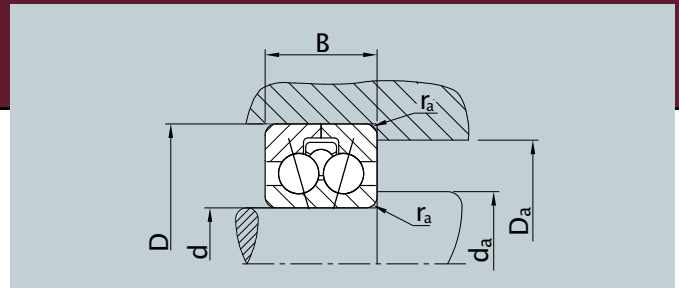
Dimensions are in accordance with dimensional series 10, 20, 02, 03 / bearing series 70, 72, 73. The K series bearings are particularly advantageous, featuring a space saving d/D , when compared to the dimension series 10/bearing series 70. Two rows within the dimensions of a single row bearing !

Accuracy is according to precision classes P5/ABEC 5 ...P2/ABEC 9, and even better with UKF-precision 0/0, respectively, HQ (see Running Precision). The cageless design (no rigid retainer) provides reduced wear, yielding longer running lifetimes while maintaining higher running precision.

Series K, UK

Double Row, with rolling ball guidance (Spacer Balls),
preloaded, Contact Angle $\alpha = 16^\circ$

Dimensions: K = manufacturer's standard
UK = dimensional series 20
(d and D like Bearing Series 70)



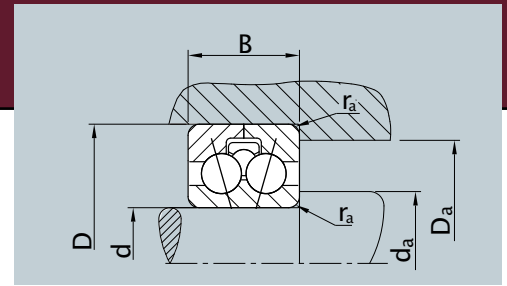
Nominal Size			UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass
d	D	B		C ₀	C	n _{lim} RPM		r _a	d _a	D _a	m
mm				N	N	Grease lubrication	minimum oil lubrication	mm			kg
20	40	14	K 20	9600	13300	7000	8500	0,6	26	34	0,080
	42	14	UK 20	10200	13800	7000	8500	0,6	26	36	0,095
25	47	15	K 25	13000	16900	6000	7000	0,6	33	41	0,118
30	55	16	K 30	17300	21100	5000	6000	0,6	37	48	0,168
35	60	17	K 35	20300	24400	4500	5500	0,6	42	53	0,200
	62	17	UK 35	21300	25000	4500	5500	0,6	42	55	0,220
40	67	18	K 40	24700	28400	4000	5000	0,6	48	59	0,225
	68	18	UK 40	24700	28400	4000	5000	0,6	48	60	0,270
45	72	19	K 45	27000	29900	3500	4500	0,6	53	64	0,290
	75	19	UK 45	29500	33100	3500	4500	0,6	53	67	0,335
50	80	20	K 50	32400	34600	3200	3800	0,6	58	72	0,380
55	85	21	K 55	35000	36000	3000	3600	0,8	65	75	0,435
	90	22	UK 55	41500	43200	3000	3600	0,8	65	80	0,550
60	92	22	K 60	43500	44200	2800	3400	0,8	70	82	0,510
	95	22	UK 60	46500	48000	2800	3400	1,0	70	85	0,585
65	100	23	K 65	50500	50000	2500	3000	1,0	75	90	0,655
70	105	24	K 70	52500	50800	2300	2800	1,0	80	95	0,720
	110	24	UK 70	62500	60600	2300	2800	1,0	80	100	0,840
75	110	25	K 75	56500	52200	2200	2600	1,0	85	100	0,860
	115	24	UK 75	64800	61800	2200	2600	1,0	85	105	0,895
80	120	26	K 80	67000	62400	2100	2500	1,0	92	108	1,000
	125	27	UK 80	69500	63600	2100	2500	1,0	92	113	1,210
85	125	28	K 85	72000	64800	2000	2400	1,0	97	113	1,165
	130	27	UK 85	72000	64800	2000	2400	1,0	97	118	1,310
90	135	30	K 90	89000	80400	1800	2200	1,0	102	123	1,495
	140	30	UK 90	92000	82100	1800	2200	1,0	102	128	1,610
95	140	32	K 95	89000	79200	1700	2000	1,3	109	126	1,665
	145	30	UK 95	92000	81600	1700	2000	1,3	109	131	1,710
100	150	34	K 100	109000	98400	1600	1900	1,3	114	136	2,080
105	160	36	K 105	127000	113000	1500	1800	1,3	119	146	2,590
110	170	38	K 110	136000	120000	1300	1600	1,5	124	156	3,150
115	175	39	K 115	141000	121000	1250	1500	1,5	129	161	3,345
120	180	40	K 120	146000	124000	1200	1450	1,5	134	166	3,565
130	195	40	K 130	178000	148000	1100	1300	1,5	144	181	4,130
140	210	42	K 140	201000	164000	1000	1200	1,5	156	194	5,000
150	225	45	K 150	225000	182000	950	1150	1,8	166	209	6,180
160	235	48	K 160	241000	188000	850	1000	1,8	176	219	6,970
170	250	52	K 170	274000	214000	800	950	1,8	190	230	8,550
180	260	52	K 180	287000	215000	800	950	1,8	200	240	9,000
190	280	55	K 190	356000	271000	750	900	1,8	210	260	12,000
200	300	58	K 200	401000	306000	700	850	2,0	220	280	14,000
220	340	65	K 220	527000	383000	600	700	2,0	240	320	22,100
240	360	72	K 240	565000	395000	500	600	2,0	260	340	26,500

UKF Angular Contact Ball Bearings with Spacer Balls

Series UL, UM

Double Row, with rotating Spacer Balls
preloaded,
Contact Angle $\alpha = 16^\circ$

Dimensions: UL like Bearings of Series 72
UM like Bearings of Series 73



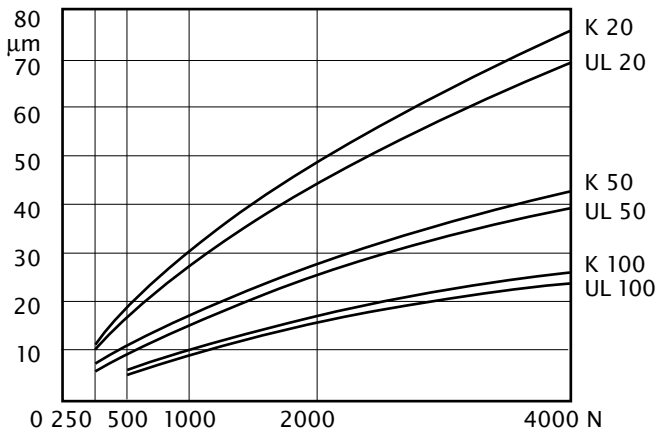
Nominal Size			UKF Type		Ratings		Speed Limit		Seat Dimensions			Mass
d	D	B			C ₀	C	n _{lim} RPM		r _a	d _a	D _a	m
mm					N	N	Grease lubrication	minimum oil lubrication	mm			kg
15	35	11	UL	15	7800	11500	7000	8500	0,60	20	30	0,050
17	40	12	UL	17	12200	14400	6800	8000	0,60	21	34	0,080
	47	14	UM	17	14200	19600	6100	7000	1,00	24	40	0,135
20	47	14	UL	20	14200	19600	6300	7500	0,60	26	41	0,115
	52	15	UM	20	16500	22300	5700	7000	1,00	28	44	0,170
25	52	15	UL	25	17600	23400	5400	6500	0,60	32	46	0,145
	62	17	UM	25	23000	29800	4900	6000	1,00	33	54	0,260
30	62	16	UL	30	23000	28700	4500	5500	0,60	37	55	0,230
	72	19	UM	30	31100	38400	4100	5000	1,00	38	64	0,400
35	72	17	UL	35	29200	34400	4100	5000	0,60	43	64	0,320
	80	21	UM	35	38500	46200	3700	4500	1,00	45	70	0,530
40	80	18	UL	40	34700	39500	3600	4300	0,60	48	72	0,425
	90	23	UM	40	49500	57000	3200	3800	1,20	50	80	0,730
45	85	19	UL	45	40900	45000	3200	3800	0,60	53	77	0,485
	100	25	UM	45	58500	66600	2800	3400	1,20	55	90	0,980
50	90	20	UL	50	45500	49600	2900	3500	0,60	58	82	0,540
	110	27	UM	50	73000	79800	2600	3100	1,50	62	98	1,280
55	100	21	UL	55	52800	55800	2700	3200	0,80	65	90	0,695
	120	29	UM	55	84500	91200	2400	2900	1,50	67	108	1,650
60	110	22	UL	60	61000	62200	2500	3000	0,80	70	100	0,930
	130	31	UM	60	97000	103000	2300	2800	1,50	74	116	2,050
65	120	23	UL	65	69500	69000	2300	2800	0,80	75	110	1,150
	140	33	UM	65	71000	116000	2000	2400	1,80	79	126	2,540
70	125	24	UL	70	76000	75000	2100	2500	0,80	80	115	1,250
	150	35	UM	70	132000	134000	1900	2300	1,80	84	136	3,100
75	130	25	UL	75	83000	80400	2000	2400	0,80	85	120	1,400
	160	37	UM	75	148000	148000	1800	2200	2,00	89	146	3,700
80	140	26	UL	80	93800	88700	1900	2300	1,00	92	128	1,740
	170	39	UM	80	165000	163000	1700	2100	2,00	96	154	4,440
85	150	28	UL	85	110000	102000	1800	2200	1,00	97	138	2,070
90	160	30	UL	90	126000	116000	1600	1900	1,30	102	148	2,610
95	170	32	UL	95	144000	131000	1500	1800	1,30	109	156	3,200
100	180	34	UL	100	157000	143000	1400	1700	1,30	114	166	3,880
105	190	36	UL	105	176000	148000	1300	1600	1,50	119	176	4,000
110	200	38	UL	110	186000	167000	1200	1400	1,50	124	186	5,000
120	215	40	UL	120	219000	193000	1000	1200	1,50	134	201	6,400

UKF Angular Contact Ball Bearings

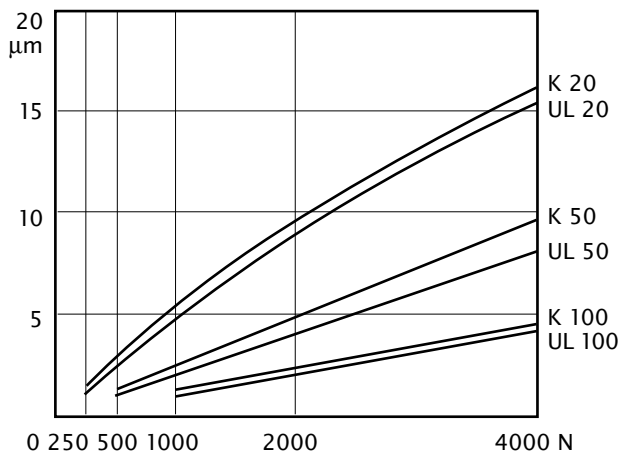
Elasticity and Rigidity

The following examples depict the effects of these two properties, relative to changes in load and bearing size, in this example light or medium bearings (K, UL) and a medium preload:

Elasticity - radial deflection of preloaded bearings (displacement, in μm ; load, in N)



Elasticity - axial deflection of preloaded bearings (displacement, in μm ; load, in N)



Handling and Assembly

The bearings are furnished ready for installation; their preload is preset at the factory. Assembly only requires that the bearings are pushed into place by hand, and then secured. No adjustment for the preload is needed. (Also, see Mounting Instructions).

In the event a bearing must be washed, cleanup is easy because all of the parts are in rolling contact. There are no rigid cages to interfere with cleaning.

Calculation Example

(Also see Calculation Principles)

Determine the nominal lifetime L_h in hours, for a bearing type K 50.

The bearing runs under radial forces of $F_r = 2500 \text{ N}$ and axial forces $F_a = 1000 \text{ N}$, speed is $n = 1000 \text{ RPM}$

Ratings: Static	$C_o = 32400 \text{ N}$
Dynamic	$C = 34600 \text{ N}$
Speed Factor	$f_n = 0,322$

Calculate, as follows:

$$\frac{2 \cdot F_a}{i \cdot C_o} = \frac{2 \cdot 1000 \text{ N}}{1 \cdot 32400 \text{ N}} = 0,062$$

The result is the limiting value to chose the factors X and Y: $e = 0,43$

$$\frac{F_a}{F_r} = \frac{1000 \text{ N}}{2500 \text{ N}} = 0,40 < e$$

$$X = 1 \quad Y = 1,46$$

The dynamic equivalent load is therefore:

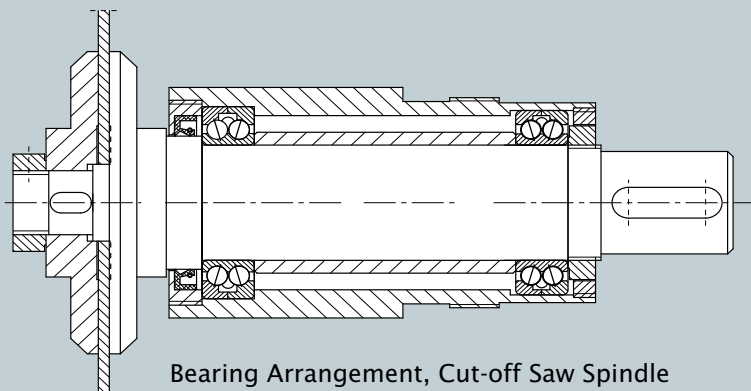
$$P = X \cdot F_r + Y \cdot F_a = 1 \cdot 2500 \text{ N} + 1,46 \cdot 1000 = 3960 \text{ N}$$

Now the value for the dynamic load can be found:

$$f_L = \frac{C}{P} \cdot f_n = \frac{34600 \text{ N}}{3960 \text{ N}} \cdot 0,322 = 2,81$$

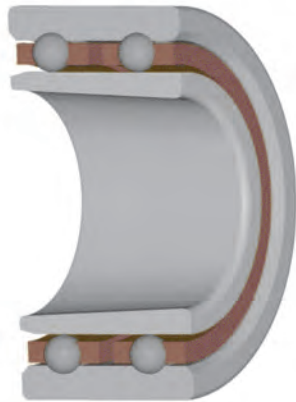
This yields a nominal lifetime of $L_h = 11000 \text{ h}$.

Design Example



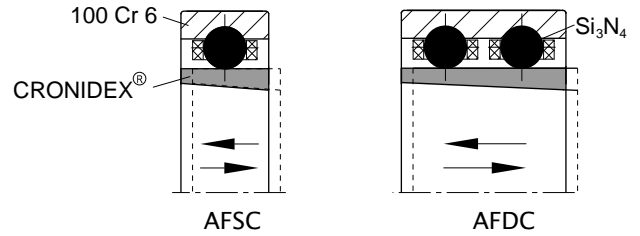
UKF Spindle Bearings for axially expanding shafts

- Floating Bearing "AF.." with Ceramic Balls (Hybrid Bearings)
- Series 70 AFSC Single Row, 70 AFDC Double Row



70 AF..
one-piece Inner- and Outer Rings
Cylindrical Inner Ring
Axially non-constraining,
floating bearing design

70 AFDC double row



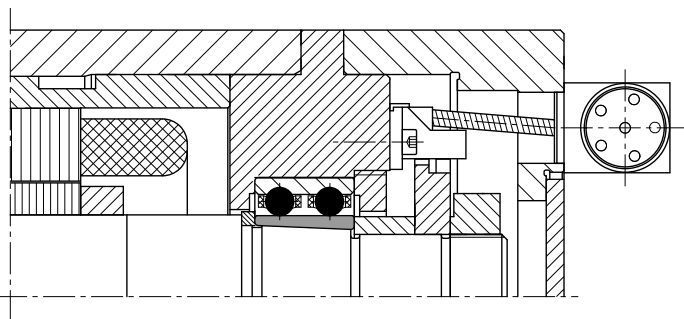
Single Row Design AFSC
for lower loads and high speeds

The axial displacement permitted by a floating design poses special design considerations. Special attention must be given to the overall design in order to maximize the performance of the floating bearing. Particularly advantageous is the application of a double row bearing, consisting of an outer assembly from an UKF USO bearing. The unitized outer assembly provides superior support, rigidity, and sliding characteristics.

Therefore, a double-row bearing with a cylindrical inner sleeve was designed. The axial compensation is accomplished entirely within the bearing itself, by allowing the Inner Ring to slide relative to the outer assembly. The seat in the housing remains unchanged. The bearings can be produced with ceramic balls for high speeds; for longer lifetimes with CRONIDEX®-steel inner rings, combined with stable support of the shaft (two raceways and a one-part Outer Ring resist tilting). A conical bore provides a simple built-in adjustment; simply push onto the shaft until seat is tight, and free of play.

- Options:
- Shields (2Z)
with Grease Lubrication for life
→ page 26
 - Direct Lubrication (LB)
to the Outer Ring races
→ page 26

Design Example



Floating Bearing "AFDC"

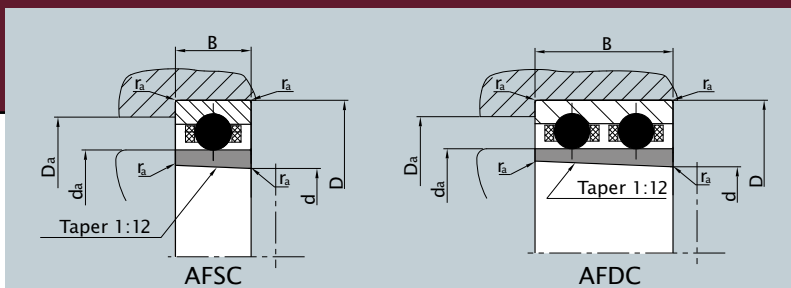


UKF Floating Bearing

Series AFSC, 70 AFDC

One-piece Inner- and Outer Rings,
cylindrical bearing races on the
Inner Ring CRONIDEX®

- Floating Bearing with integrated Axial Displacement

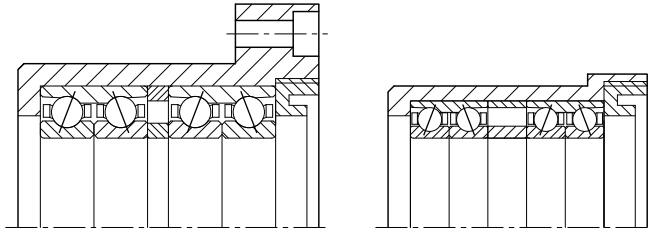


Nominal Size			UKF Type	Ratings		Speed Limit		Seat Dimensions			Mass m kg
d	D	B		C ₀ N	C N	n _{lim} RPM		r _a	d _a	D _a	
	mm					Grease lubrication	minimum oil lubrication		mm		
20	42	12	70 AFSC 20	416	4860	48000	73600	0,3	24,0	37,0	0,07
	42	24	70 AFDC 20	832	7560	45000	69000	0,3	24,0	37,0	0,14
25	47	12	70 AFSC 25	475	5085	41600	64000	0,3	28,0	39,0	0,07
	47	24	70 AFDC 25	949	7910	39000	60000	0,3	28,0	39,0	0,14
30	55	13	70 AFSC 30	605	6615	35200	54400	0,3	35,0	50,0	0,11
	55	26	70 AFDC 30	1209	10290	33000	51000	0,3	35,0	50,0	0,22
35	62	14	70 AFSC 35	800	8145	31200	47200	0,6	39,5	56,5	0,15
	62	28	70 AFDC 35	1600	12670	29000	44000	0,6	39,5	56,5	0,30
40	68	15	70 AFSC 40	884	8325	27200	41600	0,6	46,0	61,0	0,18
	68	30	70 AFDC 40	1768	12950	25000	39000	0,6	46,0	61,0	0,36
45	75	16	70 AFSC 45	1235	11610	24800	38400	0,6	49,5	69,0	0,22
	75	32	70 AFDC 45	2470	18060	23000	36000	0,6	49,5	69,0	0,44
50	80	16	70 AFSC 50	1430	12510	22400	35200	0,6	55,0	74,5	0,24
	80	32	70 AFDC 50	2860	19460	21000	33000	0,6	55,0	74,5	0,48
55	90	18	70 AFSC 55	1573	12690	20000	32000	0,6	59,5	84,0	0,35
	90	36	70 AFDC 55	3146	19740	18750	30000	0,6	59,5	84,0	0,70
60	95	18	70 AFSC 60	1742	14130	19200	29600	0,6	64,5	89,0	0,38
	95	36	70 AFDC 60	3484	21980	18000	27000	0,6	64,5	89,0	0,76
65	100	18	70 AFSC 65	1846	14445	17600	28000	1,0	70,0	94,0	0,40
	100	36	70 AFDC 65	3692	22470	16500	26000	1,0	70,0	94,0	0,80
70	110	20	70 AFSC 70	2457	18900	16000	25600	1,0	76,0	103,0	0,55
	110	40	70 AFDC 70	4914	29400	15000	24000	1,0	76,0	103,0	1,10
75	115	20	70 AFSC 75	2600	19350	15200	24000	1,0	81,0	108,0	0,58
	115	40	70 AFDC 75	5200	30100	14000	22500	1,0	81,0	108,0	1,16
80	125	22	70 AFSC 80	3283	25695	14400	22400	1,0	87,0	117,0	0,78
	125	44	70 AFDC 80	6565	39970	13500	21000	1,0	87,0	117,0	1,56
85	130	22	70 AFSC 85	3738	27225	13600	21600	1,0	92,0	122,0	0,82
	130	44	70 AFDC 85	7475	42350	12500	20000	1,0	92,0	122,0	1,64

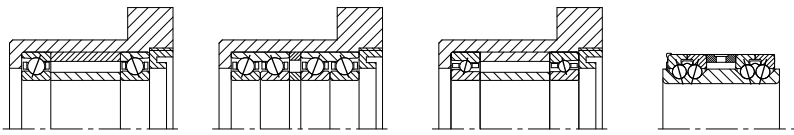
UKF Bearing Cartridges

Overview

Designs with flanges or collars



Bearings in various configurations (alternatively with Ceramic Balls ..."C")



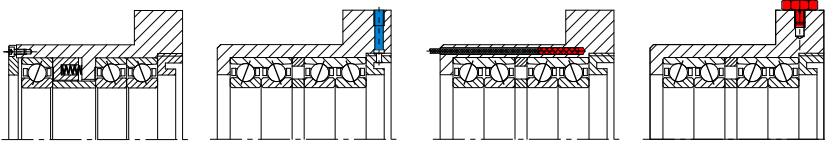
Spindle Bearings
LKSS (C)

Spindle Bearings
LKSO (C)

High Speed
Spindle Bearings
LKHS(C)

Spindle Bearings
LS
with Spacer Balls

Options

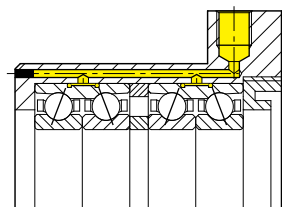


FA
Springs

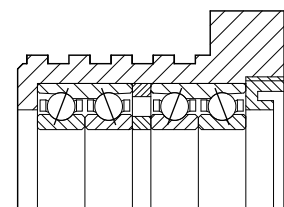
SL
Air Purge

TS
Temperature-
Monitoring

VS
Vibration
Monitoring



VR
variable
preload
VARIORING



FK
liquid cooled
jacket



Integrated Bearing Set
preloaded
labyrinth seal
ready to assemble

UKF Bearing Cartridges

Cartridges are factory assembled Sets of Spindle Bearings, preloaded and greased, complete with applicable seals, ready for installation. This reduces parts count, as well as manufacturing and assembly times, by combining Covers, Seals, and Distance Rings into an easily installed, integrated assembly. Simply install the unit into a cylindrical bore in the applicable housing, and insert the shaft.

Sleeves are heat-treated steel, and are ground, including the outside diameter to the mounting face of the flange or collar. This facilitates checking and justifying any angular misalignment of the mount. Flanges are provided with threaded jackscrew holes for easy removal, while cover plates include an integrated labyrinth. Mating Splash Rings are available for installation on the shaft.

Bearing Configurations

Various internal configurations are possible; these include 2 x 2 rows (= Standard "2DB") or "TBT", "QBC", "QBT", and "DB". The bearings are spaced to provide rigidity and a large span for supporting the shaft.

Cartridge Types

(P)LKSO... respectively, (P)LKSOC... assembled with Spindle Bearings 70 or 719, alternatively Hybrid Bearings with Ceramic Balls ("...C"). Note: "P" Prefix indicates smaller sleeve, reduced outer diameter; collar instead of a flange.



Type PLKHS

Options

Cartridge configuration "TBT-FA"

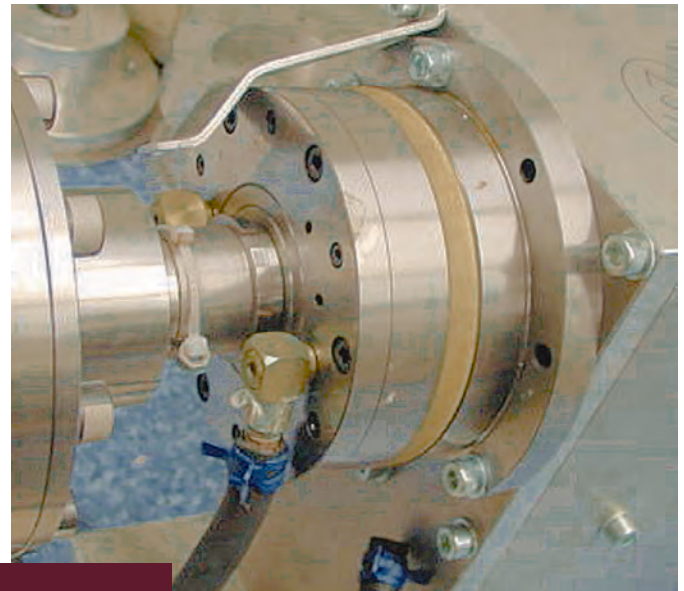
Spring loaded design: the third bearing's Outer Ring is axially loaded with springs to provide compensation for the doubled preload of the front bearing pair, and to prevent migration of the third row.

Sealing: either with lip seals or labyrinth; air purge is available with external connection, and with exhaust through the labyrinth.

Sensors: for temperature and/or vibration, integrated in the housing.

Variable Preload: by applying hydrostatic pressure around the Outer ring, between the bearing and the housing. No additional mechanical parts, higher preload available as needed, simply switch on or off.

Special Design with liquid cooling: similar to water cooled spindle cartridges, the Bearing Cartridges can be designed with cooling or heating capability, in order to maintain thermal equilibrium, such as in an air conditioned room.



reduces parts and production operations

shortens idle times



Type LKLS

Type LKLS, PLKLS

Featuring 2 x 2 track-bearings with Spacer Balls, preloaded, and a one-part Inner Ring, resulting in exceptional rigidity and maximum running accuracy. Inner Ring with the two bearings can also be supplied separately as "Cartridge System" (LS). Type "PLK..." with reduced outer diameter and a collar instead of a flange.

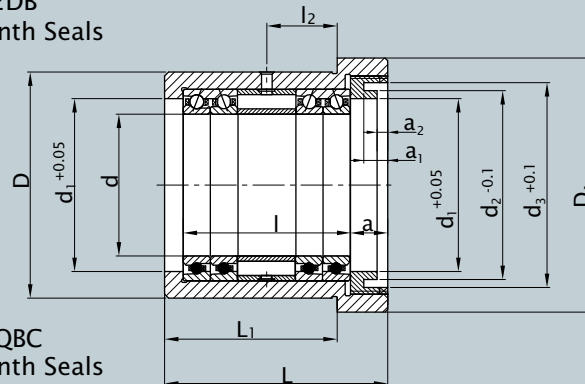
For higher axial forces (e. g., drilling) an additional bearing for axial forces can be provided.

UKF Bearing Cartridges – Bearings Series 719

Series PLKSO, PLKSS with Spindle Bearings, PLKSOC with Hybrid Bearings

Series PLKHS with High Speed Spindle Bearings, PLKHC with Hybrid Bearings

PLKSO . . . 2DB
with Labyrinth Seals



PLKHC . . . QBC
with Labyrinth Seals

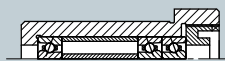
Outer sleeve available with a flange in lieu of collar

Possible bearing configurations

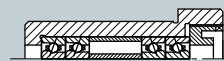
...DB



...TBT



...QBC



...PBC



Dimensions are in mm; external dimensions are maintained, regardless of internal bearing configuration:

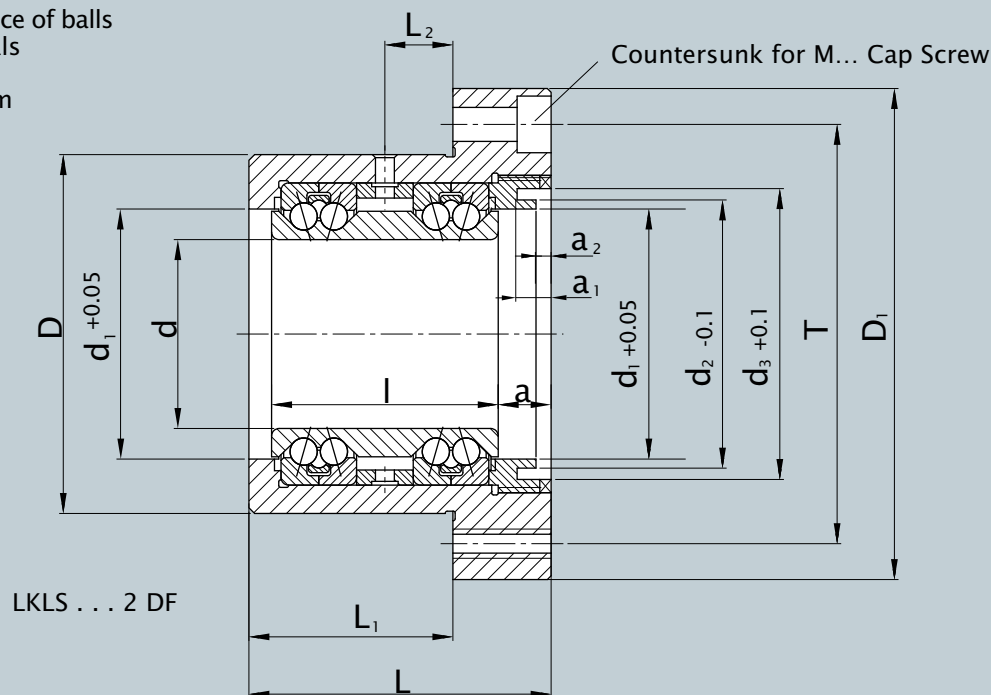
UKF Type	d	D	D ₁	d ₁	d ₂	d ₃	L	L ₁	L ₂	l	a	a ₁	a ₂	
PLK S.	25	50	57	35	39	45	70	56	23,5	55	10	8	3	
	30	55	62	42	47	53	75,5	60	25,5	59	11,5	9	3,5	
	35	65	73	46	51	57	79,5	64	27,5	63	11,5	9	3,5	
	40	72	80	52	57	63	84,5	69	29,5	67	11,5	9	3,5	
	45	78	86	57	63	69	89	73	31,5	71	12	8	4	
	50	85	93	65	71	77	92	73	30,5	71	14	9	4	
	55	90	98	69	75	81	101	81	34,0	79	14,5	10	4	
	60	95	103	75	82	89	101	81	34,0	79	14,5	10	4	
	resp.	65	100	108	82	88	94	104	81	33,5	79	17	12	5
		70	110	118	86	92	99	112	89	37,5	87	17	12	5
PLK H.	75	115	123	92	98	105	112	89	37,5	87	17	12	5	
	80	120	128	100	106	113	120	96	41,5	95	18	12	5	
	85	130	138	103	109	116	121	97	41,5	95	18	12	5	
	90	140	150	112	118	126	128	104	44,5	103	17	12	5	
	100	155	165	124	131	139	131	106	44,5	103	18	13	5	
110	165	175	137	144	152	150	123	52,5	119	20	14	7		
120	180	190	147	153	161	148	121	49,5	119	17	14	7		
130	195	205	160	168	178	170	141	59,5	139	19	14	7		
140	205	215	170	180	190	173	141	59,5	139	22	15	7		
150	225	235	185	195	205	182	149	63,5	147	23	15	7		

UKF Bearing Cartridges

Type LKLS

with rolling guidance of balls
and Labyrinth Seals

Dimensions in mm



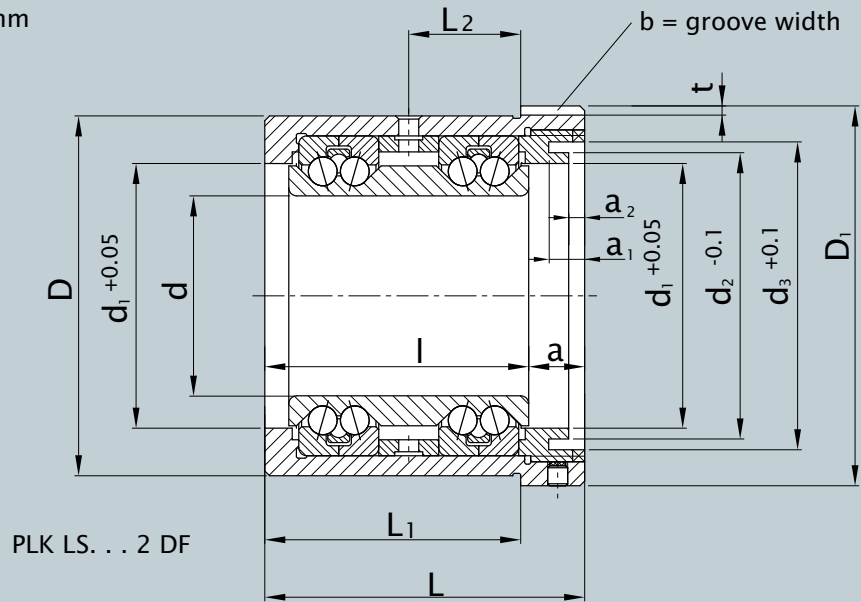
UKF Type	d	D	D ₁	d ₁	d ₂	d ₃	T	Screw Size	L	L ₁	L ₂	l	a	a ₁	a ₂
LKLS 25	25	62	85	35	39	45	71		60	40	13	45	10	8	3
LKLS 30	30	68	95	42	47	53	78	M6	66	44	15	50	11,5	9	3,5
LKLS 35	35	72	95	46	51	57	82	3 x 120°	66	44	14	50	11,5	9	3,5
LKLS 40	40	80	105	52	57	63	90		61	44	13	50	11,5	9	3,5
LKLS 45	45	90	125	57	63	69	105	M8	72	50	11	55	12	8	4
LKLS 50	50	95	130	65	71	77	111	3 x 120°	80	54	18	60	14	9	4
LKLS 55	55	105	140	69	75	81	120		87	60	20	65	14,5	10	4
LKLS 60	60	110	150	75	82	89	128		87	59	19	65	14,5	10	4
LKLS 65	65	120	160	82	88	94	137		95	66	23	70	17	12	5
LKLS 70	70	125	165	86	92	99	143		100	69	24	75	17	12	5
LKLS 75	75	130	170	92	98	105	148	M10	105	73	25	80	17	12	5
LKLS 80	80	140	180	100	106	113	160	3 x 120°	110	78	28	85	18	12	5
LKLS 85	85	150	190	103	109	116	168		118	86	31	90	18	12	5
LKLS 90	90	160	200	112	118	126	177		125	92	35	100	17	12	5
LKLS 95	95	170	215	116	123	130	190	M10	133	99	35	105	17	12	5
LKLS 100	100	180	225	124	131	139	200	4 x 90°	140	105	38	110	18	13	5
LKLS 105	105	190	235	130	136	144	210		150	114	42	120	18	14	6
LKLS 110	110	200	245	137	144	152	220	M12	157	116	42	125	20	14	7
LKLS 120	120	210	255	147	153	161	230	4 x 90°	160	120	43	130	17	14	7
LKLS 130	130	230	280	160	168	178	255		172	129	46	140	19	14	7
LKLS 140	140	250	300	170	180	190	270	M12	184	137	50	160	22	15	7
LKLS 150	150	270	320	185	195	205	290	5 x 72°	195	148	55	160	23	14	7

UKF Bearing Cartridges

Type PLKLS

with rolling guidance of balls
and Labyrinth Seals

Dimensions in mm

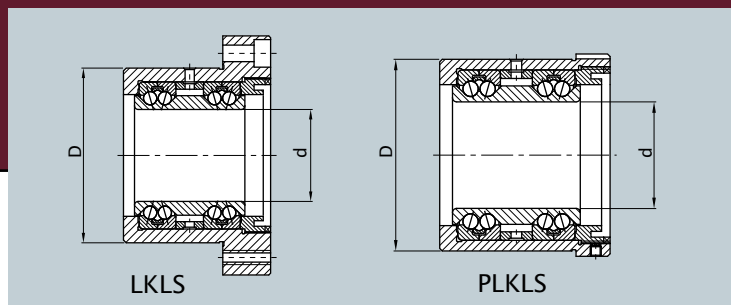


UKF Type	d	D	D ₁	d ₁	d ₂	d ₃	L	L ₁	L ₂	l	a	a ₁	a ₂	t	b
PLKLS 25	25	55	60	35	39	45	60	47	20	45	10	8	3		
PLKLS 30	30	65	70	42	47	53	66	52	23	50	11,5	9	3,5		
PLKLS 35	35	68	75	46	51	57	66	52	23	60	11,5	9	3,5		
PLKLS 40	40	75	80	52	57	63	61	53	23	50	11,5	9	3,5		
PLKLS 45	45	80	85	57	63	69	72	57	24	55	12	8	4	2,3	4,1
PLKLS 50	50	90	95	65	71	77	80	64	28	60	14	9	4		
PLKLS 55	55	95	100	69	75	81	87	70	30	65	14,5	10	4		
PLKLS 60	60	100	105	75	82	89	87	69	30	65	14,5	10	4		
PLKLS 65	65	110	115	82	88	94	95	76	33	70	17	12	5		
PLKLS 70	70	115	120	86	92	99	100	80	35	75	17	12	5	2,5	5,1
PLKLS 75	75	122	130	92	98	105	105	85	38	80	17	12	5		
PLKLS 80	80	132	140	100	106	113	110	90	40	85	18	12	5		
PLKLS 85	85	138	145	103	109	116	118	98	43	90	18	12	5		
PLKLS 90	90	150	160	112	118	126	125	103	44	100	17	12	5		
PLKLS 95	95	155	165	116	123	130	133	108	44	105	17	12	5	3	6,1
PLKLS 100	100	165	175	124	131	139	140	115	48	110	18	13	5		
PLKLS 105	105	180	190	130	136	144	150	125	53	120	18	14	6		
PLKLS 110	110	190	200	137	144	152	157	131	56	125	20	14	7		
PLKLS 120	120	200	210	147	153	161	160	133	56	130	17	14	7		
PLKLS 130	130	215	225	160	168	178	172	143	60	140	19	14	7	3	7,1
PLKLS 140	140	235	245	170	180	190	184	153	66	160	22	15	7		
PLKLS 150	150	250	260	185	195	205	195	162	70	160	23	14	7		

UKF Bearing Cartridges

Type LKLS, PLKLS

2 x 2 tracks with rolling guidance of balls and Labyrinth Seals
preloaded, Contact Angle $\alpha = 16^\circ$

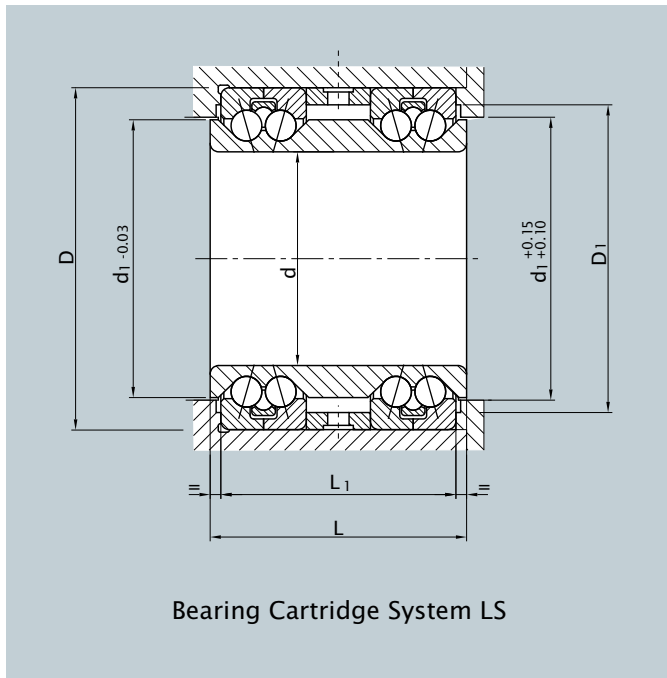


d mm	D	UKF Type	Ratings		Speed Limit		Mass m kg
			C ₀ N	C N	n _{lim} RPM Grease lubrication	n _{lim} RPM minimum oil lubrication	
25	62	LKLS 25	26000	30400	5400	6300	1,36
	55	PLKLS 25	26000	30400	5400	6300	0,72
30	68	LKLS 30	34600	37800	4500	5400	1,77
	65	PLKLS 30	34600	37800	4500	5400	1,10
35	72	LKLS 35	40600	43900	4100	5000	1,77
	68	PLKLS 35	40600	43900	4100	5000	1,15
40	80	LKLS 40	49500	51100	3600	4500	2,15
	75	PLKLS 40	49500	51100	3600	4500	1,30
45	90	LKLS 45	54000	53800	3200	4100	3,20
	80	PLKLS 45	54000	53800	3200	4100	1,55
50	95	LKLS 50	64500	62300	2900	3400	3,80
	90	PLKLS 50	64500	62300	2900	3400	2,20
55	105	LKLS 55	70000	64800	2700	3200	4,80
	95	PLKLS 55	70000	64800	2700	3200	2,60
60	110	LKLS 60	87000	79500	2500	3100	5,10
	100	PLKLS 60	87000	79500	2500	3100	2,65
65	120	LKLS 65	101000	90000	2300	2700	6,70
	110	PLKLS 65	101000	90000	2300	2700	3,55
70	125	LKLS 70	105000	91400	2100	2500	7,40
	115	PLKLS 70	105000	91400	2100	2500	4,00
75	130	LKLS 75	113000	93900	2000	2300	8,20
	122	PLKLS 75	113000	93900	2000	2300	4,80
80	140	LKLS 80	134000	112000	1900	2200	9,70
	132	PLKLS 80	134000	112000	1900	2200	6,00
85	150	LKLS 85	144000	117000	1800	2100	11,55
	138	PLKLS 85	144000	117000	1800	2100	6,90
90	160	LKLS 90	168000	143000	1600	2000	14,00
	150	PLKLS 90	168000	143000	1600	2000	9,10
95	170	LKLS 95	178000	145000	1500	1800	16,95
	155	PLKLS 95	178000	145000	1500	1800	10,15
100	180	LKLS 100	218000	177000	1400	1700	19,80
	165	PLKLS 100	218000	177000	1400	1700	12,30
105	190	LKLS 105	254000	203000	1300	1600	23,00
	180	PLKLS 105	254000	203000	1300	1600	14,90
110	200	LKLS 110	272000	216000	1200	1400	26,30
	190	PLKLS 110	272000	216000	1200	1400	18,50
120	210	LKLS 120	292000	223000	1100	1300	28,50
	200	PLKLS 120	292000	223000	1100	1300	20,45
130	230	LKLS 130	356000	266000	1000	1200	37,70
	215	PLKLS 130	356000	266000	1000	1200	28,30
140	250	LKLS 140	402000	295000	900	1100	47,00
	235	PLKLS 140	402000	295000	900	1100	32,90
150	270	LKLS 150	450000	328000	800	1000	61,30
	250	PLKLS 150	450000	328000	800	1000	39,90

UKF Bearing Cartridge Systems LS

The Bearing Cartridges (P)LKSO and (P)LKHS, as described, are based on Spindle Bearings

but the Type LKLS and PLKLS contain, as a special feature, the Bearing Cartridge System LS.



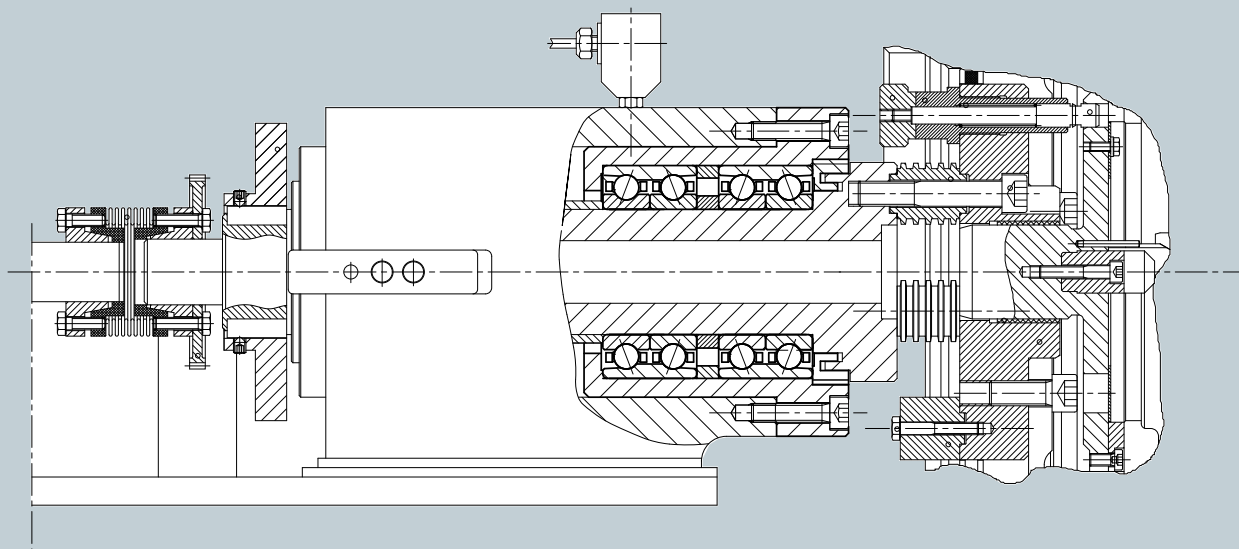
Bearing Cartridge System LS

Dimensions in mm

UKF Type	d	D	D ₁	d ₁	L	L ₁	m kg
LS 25	25	47	35	40	45	40	0,31
LS 30	30	55	42	48	50	45	0,41
LS 35	35	60	46	52	50	45	0,50
LS 40	40	67	52	59	50	45	0,64
LS 45	45	72	57	64	55	50	0,79
LS 50	50	80	65	72	60	55	1,05
LS 55	55	85	69	75	65	60	1,25
LS 60	60	92	75	82	65	60	1,42
LS 65	65	100	82	90	70	65	1,80
LS 70	70	105	86	95	75	70	2,10
LS 75	75	110	92	100	80	75	2,35
LS 80	80	120	100	108	85	80	3,20
LS 85	85	125	103	113	90	85	3,40
LS 90	90	135	112	123	100	93	3,90
LS 95	95	140	116	126	105	98	4,40
LS 100	100	150	124	136	110	103	4,90
LS 105	105	160	130	146	120	115	7,80
LS 110	110	170	137	156	125	119	9,20
LS 120	120	180	147	166	130	125	10,80
LS 130	130	195	160	180	140	132	13,68
LS 140	140	210	170	192	150	145	16,45
LS 150	150	225	185	208	160	155	21,25

Detailed description is provided under the Bearing Cartridges LKLS, PLKLS (→ table)

Design Example



Bearing Cartridge LKSO 2 DB preloaded, with Distance Rings and Labyrinth Seal, ready for installation

Accuracy, Tolerances

Spindle Bearings and Bearing Cartridges are manufactured in Precision Classes from UKF I (Standard) to UKF 0, or even higher. Axial runouts of the inner ring (which is the rotating part in most cases), to $< 1 \mu\text{m}$, (bore $d < 50 \text{ mm}$), in accordance with UKF precision „HQ“, are also available. For larger bore bearings, consult the factory.

UKF Angular Contact Ball Bearings with Spacer Balls are made in the Precision Class 1/2 (Standard) or better. Higher precision is available per the table below; also special precision, „HQ“, with radial runout to $1 \mu\text{m}$, respectively, $1,5 \mu\text{m}$. Consequently, it is possible to combine various Inner/Outer ring accuracies to meet specific requirements, e. g., UKF O/I, HQ/I, or others.

The dimensional accuracy (size tolerances), in combination with the running precision (classes), is shown in the respective tables. For especially challenging applications, bearings can be factory screened, such that all bearings of a specific lot have no more than $2...3 \mu\text{m}$ variation in bore diameter.

The point of maximum runout (ring's eccentricity), along with the size variation (actual measured deviation), is marked on the bearing.

Bearing widths are, in general, manufactured to higher tolerances than the standardized values for Δ_{Bs} , Δ_{Cs} . In case of specific tolerance requirements, please contact UKF.

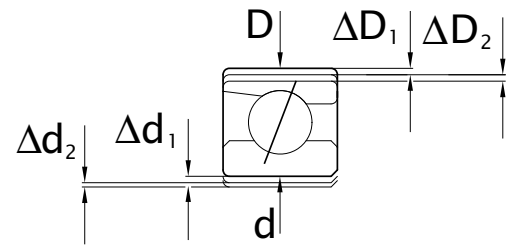
UKF Grade	more precise than		
	ISO	DIN	ABEC
HQ	Non-standardized, Ultra Precision		
0	2	P2	9
I	4	P4	7
1, 1/2	5	P5	5

Basically, UKF Spindle Bearings are manufactured to specifications, which exceed the accepted standards.

Markings

To simplify volume production requirements, bearings can be factory pre-sorted into matched Bearing Sets. Bearings can then be easily coordinated for best fit with the other components of the assembly, to speed assembly processes.

Reduced dimensional variation of d and D



Dimensional tolerances and maximum runout K_{ia} , K_{ea} typical



Inner Ring

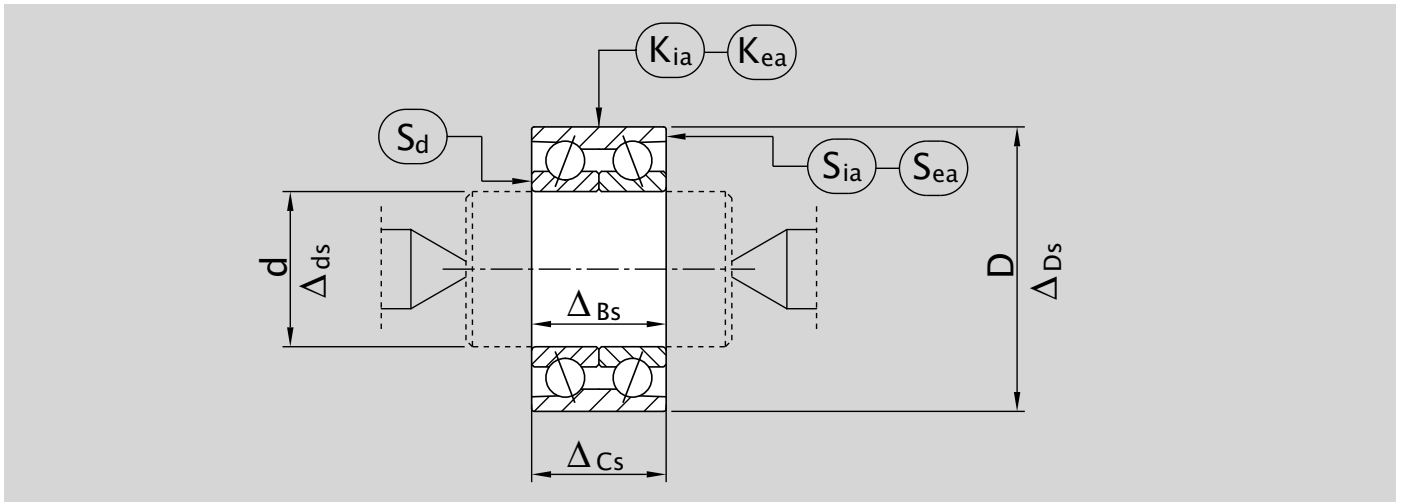
- K_{ia} = Radial Runout
- S_{ia} = Axial Runout
- S_d = Orthogonality, ID to face
- Δ_{ds} = Variation of Bore diameter to Nominal value
- Δ_{Bs} = Variation of width to Nominal Value
- V_{Bs} = Parallelism

Outer Ring

- K_{ea} = Radial Runout
- S_{ea} = Axial Runout
- Δ_{Ds} = Variation of Outer Diameter to Nominal Value
- Δ_{Cs} = Variation of width to Nominal Value (similar to Δ_{Bs})

Designations according to DIN 620, DIN ISO 1132

Accuracy Grades



Running Precision, values in μm

d/D in mm	up to	18	30	50	80	120	150	180	250	315	400	class
Inner Ring (d)	K_{ia}	1	1	1	1,5	upon agreement						UKF HQ/0 ¹⁾
Inner Ring (d)	K_{ia}	1,5	2	2	2,5	2,5	2,5	4	5	-	-	UKF 0/0
	S_{ia}	2	2,5	2,5	2,5	2,5	2,5	5	7	-	-	better
	S_d	1,5	2	2	2	2,5	2,5	3	4	-	-	than
Outer Ring (D)	K_{ea}	-	2,5	2,5	4	5	5	5	6,5	8	10	P 2/
	S_{ea}	-	2,5	2,5	4	5	5	5	6,5	8	10	ABEC 9
Inner Ring (d)	K_{ia}	1	1	1	1,5	upon agreement						UKF HQ/I ²⁾
Inner Ring (d)	K_{ia}	2,5	3	3	3	4	5	5	7	-	-	UKF I/I
	S_{ia}	3	4	4	4	5	7	7	8	-	-	better
	S_d	2	3	3	3	4	5	5	6	-	-	than
Outer Ring (D)	K_{ea}	-	3	3	4	5	6	7	9,0	10	12	P 4 /
	S_{ea}	-	5	5	5	6	6	7	9	9	12	ABEC 7
Inner Ring (d)	K_{ia}	3,5	4	4	5	6	6	8	9	-	-	UKF 1/1
	S_{ia}	7	8	8	8	9	10	10	13	-	-	better
	S_d	5	5	5	6	6	7	7	7	-	-	than
Outer Ring (D)	K_{ea}	-	4	4	7	9	10	13	15	18	20	P 5 /
	S_{ea}	-	8	8	10	11	13	14	15	18	20	ABEC 5
Inner Ring (d)	K_{ia}	3,5	4	4	5	6	6	8	9	-	-	UKF 1/2
	S_{ia}	7	8	8	8	9	10	10	13	-	-	IR better
	S_d	5	5	5	6	6	7	7	7	-	-	than
Outer Ring (D)	K_{ea}	-	7	7	9	12	14	16	18	20	22	P 5/
	S_{ea}	-	15	15	16	18	20	23	37	30	33	ABEC 5

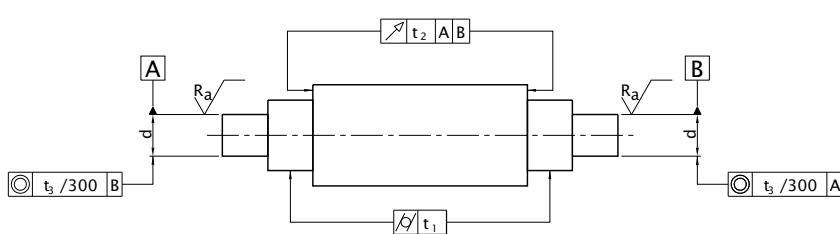
¹⁾ unspecified per UKF 0

²⁾ per UKF I

Dimensional Accuracy, values in μm

d/D in mm	bis	18	30	50	80	120	150	180	250	315	400	Class	
IR (d)	Δ_{ds}	0...	-5	-5	-6	-7	-8	-10	-10	-12	-	-	UKF 2 UKF 1
	Δ_{Bs}	0...	-60	-70	-80	-90	-100	-120	-140	-160	-180	-	
	V_{Bs}	0...	3	3	3	4	4	5	5	6	7	-	
AR (D)	Δ_{ds}	0...	-	-6	-6	-7	-8	-9	-10	-11	-13	-15	
IR (d)	Δ_{ds}	0...	-4	-4	-4	-5	-6	-8	-8	-9	-	-	UKF I UKF 0
	Δ_{Bs}	0...	-60	-70	-80	-90	-100	-120	-140	-160	-180	-	
	V_{Bs}	0...	2	2	2	3	3	4	4	5	6	-	
AR (D)	Δ_{Ds}	0...	-	-4	-4	-4	-5	-5	-6	-8	-8	-10	

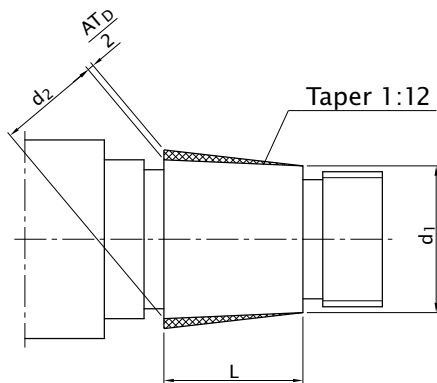
Fit Tolerances, Shaft Seats



- t_1 \varnothing cylindricity (DIN ISO 1101)
- t_2 \swarrow wobble (DIN ISO 1101)
- t_3 \odot co-axiality (DIN ISO 1101)
- R_a surface finish (DIN 4768)
- $n \cdot d_m$ speed factors
- d_m average diameter of bearing
 $d_m = (d + D)/2$

Nominal d of shaft in mm	for grades UKF 1 and 2			for grades UKF I, O and HQ			R_a				
	tolerance for d	t_1	t_2	t_3	tolerance for d	t_1		t_2	t_3		
more than		\varnothing	\swarrow	\odot	$n \cdot d_m$ in rpm · mm	\varnothing	\swarrow	\odot			
up to					$1,2 \cdot 10^6$ $> 1,2 \cdot 10^6$						
		values in μm									
18		-0 -5	1	2	6	-0 -4	+2 -2	0,5	1,2	4	0,2
18	30	-0 -6	1	2,5	8	-0 -4	+2 -2	0,5	1,5	5	0,2
30	50	-0 -7	1	2,5	8	-0 -5	+2 -3	0,5	1,5	5	0,2
50	80	-0 -8	1,5	3	9	-0 -5	+2 -3	0,8	2	6	0,4
80	120	-0 -9	1,5	3	9	-0 -6	+2 -4	0,8	2	6	0,4
120	180	-0 -10	2	4	10	-0 -8	+3 -5	1,5	3	8	0,4
180		-0 -12	3	5	12	-0 -10	+4 -6	2	4	10	0,4

Tapered seat for AF-Bearing on the shaft



Nominal value for d of shaft in mm	über	30	40	50	65	80
	bis	30	40	50	65	80
Deflection for d1 in μm		+73	+91	+108	+135	+159
		+64	+80	+97	+122	+146

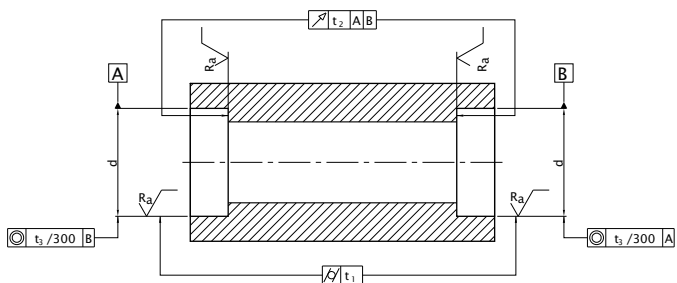
Nominal value for length of cone L in mm	above	25	40
	up to	25	40
Deviation of Angle of cone AT_D in μm		+2,0 0	+2,5 0
			+3,0 0

- d_1 minor diameter of cone
 $d_1 \cong d = \text{nominal of shaft}$
- d_2 major diameter of cone
 $d_2 = d_1 + 0,08334 \cdot L$
- L length of taper $L = 0,95 \cdot B$
($B = \text{width of bearing}$)
- AT_D Tolerance of taper angle as difference of diameters orthogonal to the centerline

Tolerances for form accuracy, location, and average roughness same as for cylindrical bearing seats

Included angle of cone: $4^\circ 46' 18,8''$
Angle of adjustment: $2^\circ 23' 9,4''$

Fit Tolerances, Housing Seats



- t_1 ○ cylindricity (DIN ISO 1101)
- t_2 ↗ wobble (DIN ISO 1101)
- t_3 ◎ co-axiality (DIN ISO 1101)
- R_a surface finish (DIN 4768)

Nominal D of bore in mm	for grades UKF 1 and 2					for grades UKF I, O und HQ					R_a			
	more than	up to	fixed bearing	bearing	tolerance for d	t_1	t_2	t_3	fixed bearing	bearing		t_1	t_2	t_3
values in μm														
30			+4 -2	+7 +2		1,2	3	5	+3 -1	+5 +2	1	2	4	0,4
30	50		+4 -3	+8 +2		1,5	3	5	+3 -2	+6 +2	1,2	2	4	0,4
50	80		+5 -3	+10 +2		2	3	6	+4 -2	+8 +2	1,5	2	5	0,4
80	120		+6 -4	+13 +4		2,5	4	8	+5 -3	+10 +4	2	2,5	6	0,8
120	180		+8 -4	+17 +5		3	5	8	+6 -3	+14 +5	2,5	3	6	0,8
180	250		+10 -4	+20 +6		4	6	10	+8 -3	+16 +6	3	4	8	0,8
250	315		+12 -4	+23 +8		5	8	10	+10 -3	+20 +8	4	5	8	1,6
315			+13 -5	+27 +9		6	10	12	+10 -4	+23 +9	5	6	10	1,6

Installation

UKF Angular Contact Ball Bearings and Spindle Bearings require proper installation and handling, including cleanliness, as well as appropriate precision of the surrounding parts for maximum performance. As supplied, the bearings are prepared with corrosion-resistant oil or pre-lubricated for life with grease. If lubricating oils are used, the bearing(s) first have to be washed to avoid any cross-contamination. This is also necessary in case of re-lubrication with grease.

UKF spindle Bearings for universal arrangement/pairing can be combined to various configurations. As the preload is already given ex works no special adjustment is necessary.

Intermediate elements, such as Spacer Rings or sleeves must be produced with flatness and parallelism $< 0,002 \mu\text{m}$. The mating surfaces (face) of lock nuts must be orthogonal to the thread axis.

When installing bearings, all bearings should be aligned, such that their points of maximum eccentricity (marked on the bearing rings) are inline; both inner and out rings. This will provide maximum accuracy for the assembly, and minimize wobble of the spindle.

Seats on shafts and in housings should be coated with a light film of compatible oil or grease, before placing the bearings into position. Cover plates for fixing should have a sufficient number of screws, which are torqued symmetrically to minimize distortion and runout errors.

The double row UKF Spindle Bearings ("USO") feature a "one-piece Outer Ring", with separate, dual Inner Rings. To obtain the correct preload, simply lock the Inner Rings tightly against each other.

The required tightening torques of the lock nuts depend on various conditions, including bearing preload, size and pitch of the thread. The quality of the threads is also a significant factor, so each application must be evaluated separately.

The one-piece outer ring, once engaged into the housing's bore, is easy to slide into position. This is advantageous for installations, which require a floating bearing at one end, to compensate for expansion and contracting due to thermal effects.

When assembling bearings onto the shaft, respectively, into the housing, never use

force. In applications requiring a press fit, the bearing can first be warmed or cooled, as necessary, to facilitate installation. In general, temperatures of 80°C ... 90°C are sufficient; temperatures higher than 110°C are to avoid! It is important to keep all components square during assembly, and to apply symmetrical pressure against the rings when assembling the spindle.

Attention: if bearing's inside diameter, d , is near its lower size limit, the shaft's diameter should also be at the lower end. Similarly, if the bore diameter machined into the housing is finished at the upper end of tolerance, then a bearing with its tolerance of bearing diameter, D , should also be at the higher end.

Direct assembly errors can usually be detected by rotating the shaft. Intermittent binding or inconsistent rotation, are indications of an assembly mistake.

Another qualitative indicator for incorrect assembly is noise, emanating from the rotating spindle. Error must be corrected immediately.

Lubrication

UKF Angular Contact Ball Bearings and Spindle Bearings can be lubricated with either oil (including oil-mist and minimal oil-air) or grease. Bearings are shipped with an anti-corrosive oil coating, or if specified, factory greased, ready for installation. (Specials, for dry running applications, upon request.)

The double row Spindle Bearings of Type "USO" can be furnished with a bore through the Outer Ring for supplying lubricants directly into the void between the raceways, and subsequently into the two bearing grooves. In the case of grease lubrication, this void (space) can store surplus grease away of the raceways.

Because some lubricants (grease, oil) are not compatible with each other, we recommend **a thorough wash out of the bearings**, if the same products are not applied, especially if subsequent grease lubrication is proposed.

Oil

Oil lubrication, whether for high-speed (high RPM) operation or for cooling, is integral to the overall spindle design, and may consist of circulating oil, atomizers, compressed air injection and even mechanical cooling devices, as required.

As the viscosity of oil is dependant on, among other factors, the temperature – under rising temperature it will decrease – sufficient viscosity (operational viscosity) must be ensured at the normal working temperatures. For increasingly higher speeds, lower viscosity!

For example: A required operational viscosity of 12 mm²/s, combined with a normal working temperature of 40°C, requires a nominal viscosity of 9 mm²/s.

The nominal viscosity of an oil (in mm²/s at 50°C) can be obtained from the usual V-T-diagram. In general lubricating oils with EP-additives, as per DIN 51517, etc., are recommended. For peak performance, lubrication systems should provide no more than 1 drop of oil/in 6 minutes, per 25 mm bore of bearing.

With **minimal Oil Lubrication**, very small quantities of suitable oil are adequate, but it must be carefully distributed, to ensure that the oil moistens the balls and the grooves. Therefore, the nominal viscosity should not be too low to achieve a sufficient covering of oil. The nominal viscosity should be near 25 mm² at 50°C.

If a suitable operational temperature is not attained, another oil with higher or lower nominal viscosity should be used.

The necessary volume of oil per bearing is approx. 1 ml/h, per 25 mm of bearing bore diameter. For the High Speed Bearings Type "UHS" and "UHC", their pitch diameter for oil injection is specified in the dimensions table.

Grease

For grease lubrication, we recommend grease with a low apparent or dynamic viscosity, i.e., with low consistency in order minimize resistance to rotation.

As the result of many years experience, greases like ISOFLEX LDS 18 Special A and ISOFLEX NBU 15, have been found to be well suited for our Angular Contact Ball Bearings. (Messrs. Klüber: www.kluber.com). For very high RPM applications, especially with Hybrid Bearings, we suggest TURMOGREASE High Speed L 252 (Messrs. Lubcon: www.lubcon.com). But other qualified bearing greases, especially greases of NLG class 3 (for lower speed) and class 2 (for medium speed), with a penetration of 220...295, are usable.

Greases exhibiting high adhesion have demonstrated remarkable increases to the allowable speed limit, without having to employ Oil-Air-devices. Additionally, the extra cost for Hybrid Bearings becomes insignificant in relationship to the savings realized by eliminating additional infrastructure. UKF has many years of experience with Hybrid Bearings and their handling, lubrication and cooling.

A guideline for the appropriate grease can be found with this equation:

$$V_F = d_m^2 \cdot B \cdot b_F$$

V_F = volume of grease, cm³
 d_m = average diameter (d+D)/2, cm
 B = width of bearing, cm
 b_F = volume factor of grease (from table, below)

Notice: for bearings of Series "USO" and "AFDC" the calculated quantity of grease is for each row of balls.

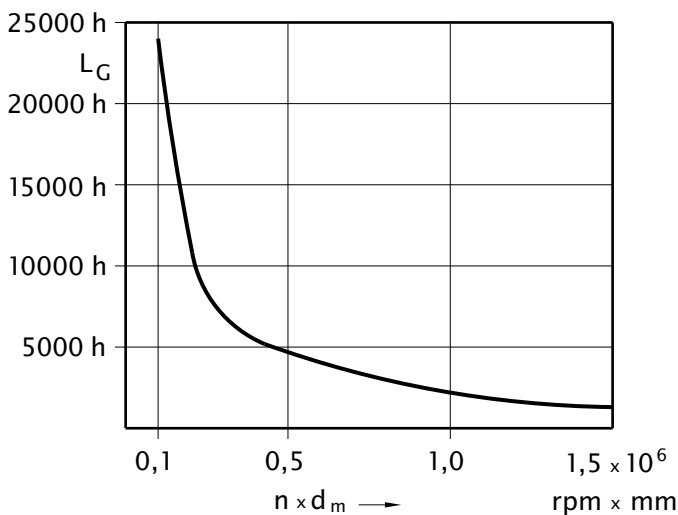
UKF Type Series	b_F			
	$d \leq 20$	$d=25..45$	$d=50..100$	$d > 100$
719 UHS/UHC	0,079	0,052	0,043	0,031
70 UHS/UHC	0,085	0,059	0,051	0,046
719 USS(C)/USO(C)	0,049	0,037	0,034	0,030
70 USS (C) USO (C)	0,064	0,048	0,039	0,036
AFSC/AFDC	0,077	0,058	0,047	0,043
K	0,012	0,008	0,007	0,006
UK	0,015	0,011	0,009	-
UL	0,014	0,013	0,011	0,010
U	0,01	0,01	0,00	

For greased bearings, a routine warm-up is recommended. A warm-up period has a significant effect on bearing life and efficiency.

Warming up should proceed by gradually increasing speeds, with the first one set at about 20 % of the maximum allowable speed. The spread between beginning and maximum speed should then be divided into four steps, during the temperature should be monitored: subsequent, higher steps can follow as soon as the temperature has stabilized.

Alternatively, a brief moderate-speed run to distribute the grease, followed by a short ramp-up to speed and then off, again, culminating with a thermal equalization period may also be used. Although this more traditional warm-up is faster, it is not as conducive to long bearing life.

The working life of grease depends on various factors, including forces, vibration, contamination, humidity and temperature – and, above all, the operating speed. The following diagram gives an overview of possible lubricant lifetimes, dependent on the characteristic value of speed $n \cdot d_m$ as rpm \cdot mm.



Lifetime L_G of grease dependent on characteristic value of speed

Temperature

High precision, super-finished races reduce friction and heat, and with time, they reduce wear and tear. Compared with paired single-row bearings, the UKF double-row bearings have higher parallelism accuracy. The design creates a void between the rows, which can effectively function as a grease reservoir. A similar configuration can result by using UKF distance rings, for High Speed Bearings Types “UHS”, “UHC”.

Hybrid Bearings will run at lower temperatures than bearings with steel balls, for the comparable speeds (RPM).

Friction

The preceding remarks about accuracy and running characteristics, under “Temperature” also apply to friction. Bearings have three kinds of friction:

1. rolling friction between the balls and raceways
2. sliding friction between balls and cages - and also between cage and its guidance on the Inner- or Outer Ring (rigid cage!)
3. viscous friction from the lubricant.

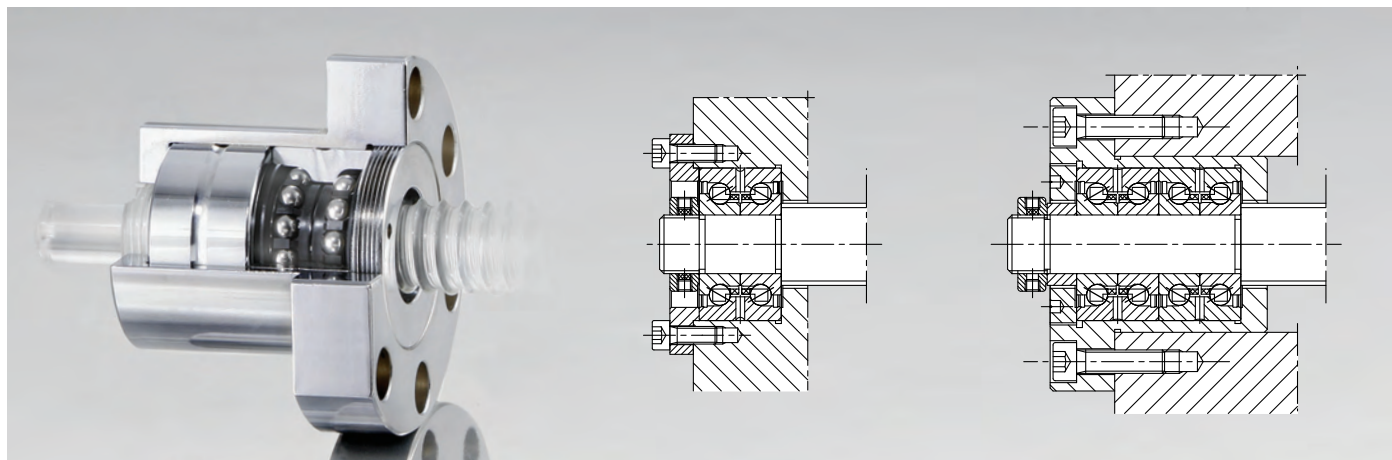
The inherent friction (resistance to rolling) in a rolling element bearing is quite low, and is insignificant when calculating f_L , L_h .

Determining an optimal preload, careful selection of lubricants, and proper care during installation may further reduce friction.

Acoustic Noise

Noise can occur as the result of vibrations being transmitted through the components. Vibrations are usually caused by problems in the rotating parts, e. g., the natural frequency of the shaft with assembled bearings (-inner ring, cage, balls). Appropriate design analysis should prevent such occurrences.

Ball Screw Support Bearings



Ball Screws must provide high-load, bi-directional support, combined with high axial rigidity and excellent accuracy. With their unitized Outer Ring, similar to the well-known UKF double-row Spindle Bearings, our GSX series provides an ideal solution.

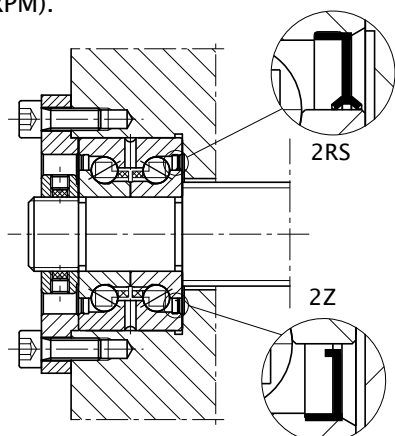
Design: separate Inner Rings, self-contained with shields or seals, synthetic cages, high contact angle, $\alpha = 60^\circ$, and increased number of balls, resulting in higher axial stiffness and load capacity. The bearing's rows are oriented in an O-configuration for high rigidity. Bearing preload is built-in at manufacture, and is realized when securing the Inner ring(s) to the shaft. GSX bearings can also be combined in paired sets.

Cover Plate DG

Standardized parts provide easy and precise installation, securing the bearing between the respective shoulders for bi-directional thrust loads.

Seals

Bearings and Bearing Cartridges with the designation "2RS" have lips seals. So a further sealing at the surrounding parts is not necessary. Bearings with the designation "ZZ" have shields on both sides, with a gap at the rotating Inner Ring. This means less friction, suitable for higher speeds (RPM).

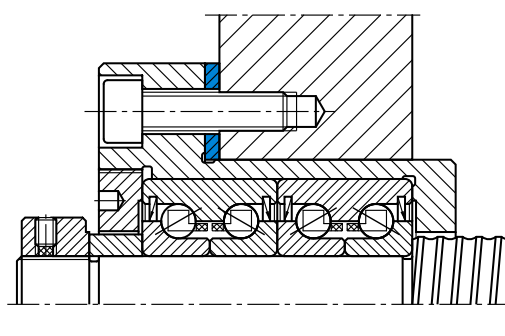


Bearing Cartridges

Double row/four row Bearing Units are assembled into flanged bushings to make production and installation easier; eliminates having to generate a shoulder in a recessed hole. A cylindrical bore, with an orthogonal face on the outside is much easier to produce. The ground cartridge (diameter and flange) allows the installer use it for checking the alignment. The flange has a machined flat for offset mounting.

Option

For an even easier installation, and for adjusting the tension of Ball Screws and the support Bearings of double-ended configurations, additional washers, as shown below, can be furnished at extra charge.

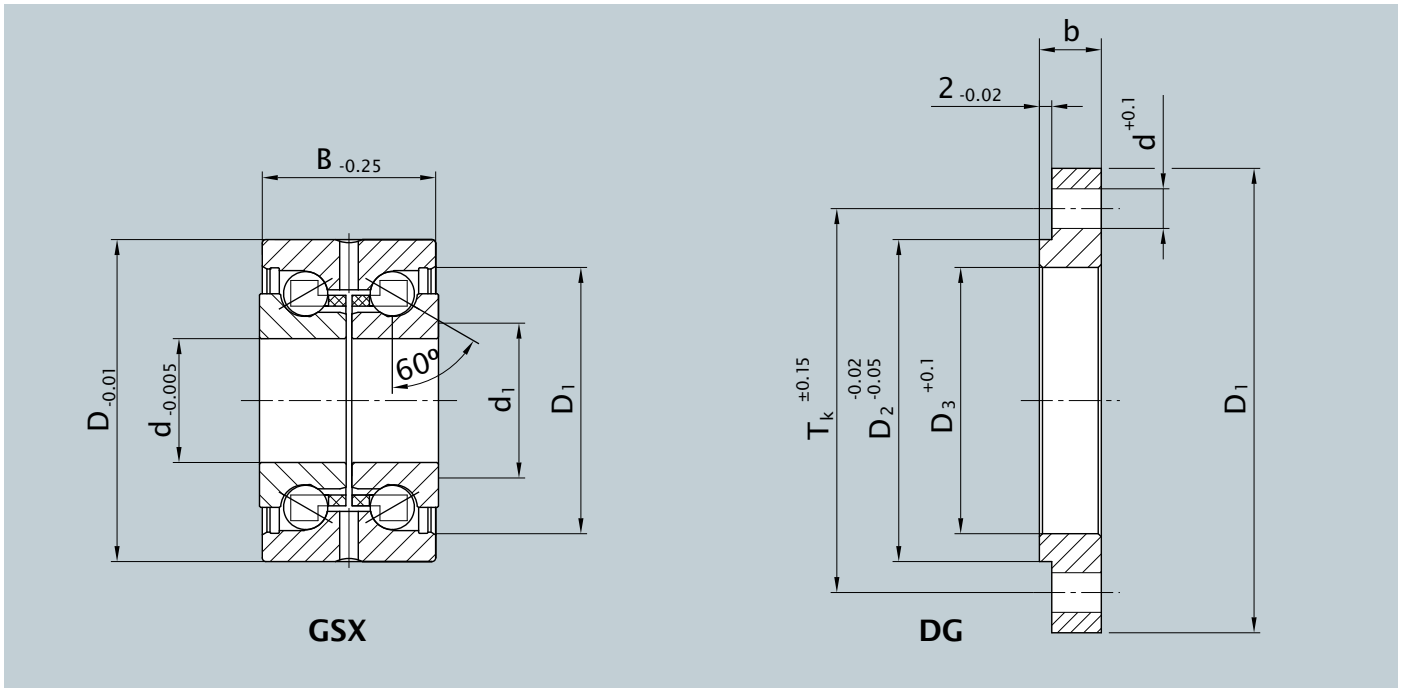


Accuracy

In accordance with the requirements of Ball Screws, the bearings provide both high running precision and dimensional accuracy.

face runout S_d	2,0 μm	at $d \leq 25 \text{ mm}$
	2,5 μm	at $d > 25 \text{ mm}$
tolerance I.D.		$\Delta_{ds} 0... -5 \mu\text{m}$
tolerance O.D.		$\Delta_{Ds} 0... -10 \mu\text{m}$
tolerance width		$\Delta_{Bs} 0... -250 \mu\text{m}$

Series GSX

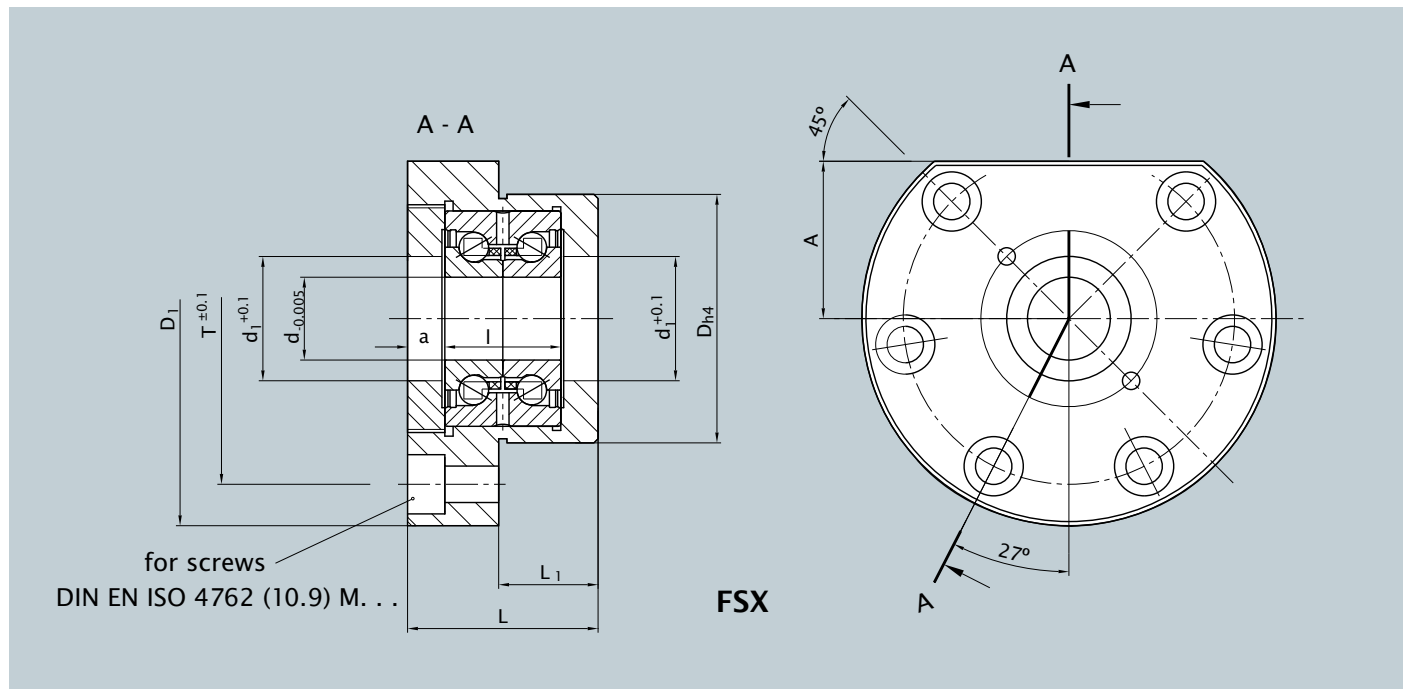


UKF Type	Dimensions			Seat Dimensions		m kg
	d	D	B	d ₁ min.	D ₁ max.	
GSX 12	12	42	25	16	33	0,20
GSX 15	15	45	25	20	37	0,21
GSX 20	20	52	28	25	43	0,31
GSX 25	25	57	28	32	48	0,34
GSX 30	30	62	28	40	53	0,39
GSX 40	40	75	34	50	67	0,61
GSX 50	50	90	34	63	81	0,88

UKF Type	d for screws					
	D ₁	D ₂	D ₃	b	T _k	
DG 12	65	42	33	10	52	M6 3 x 120°
DG 15	70	45	37	10	55	M6 3 x 120°
DG 20	75	52	43	10	62	M6 4 x 90°
DG 25	80	57	48	10	67	M6 4 x 90°
DG 30	85	62	53	10	72	M6 6 x 60°
DG 40	105	75	67	12	89	M6 6 x 60°
DG 50	120	90	80	14	104	M6 8 x 45°

UKF Type	Ratings		Axial Preload F _v N	Separating-force F _d N	Axial rigidity R _a N/μm	Tilting rigidity R _T Nm/mrad	Lock Nut Seating torque M _A Nm		Friction torque M _A Nm		Speed Limit n _{lim} rpm	
	C ₀ N	CN					2RS	2Z	2RS	2Z		
	GSX 12	24650	16900	960	2200	370	50	NM 12 X 8	0,16	0,08	3800	7600
GSX 15	27900	17850	1070	2450	400	65	NM 15 X 10	0,20	0,10	3500	7000	
GSX 20	46850	25900	2050	4750	650	135	NM 20 X 18	0,30	0,15	3000	5400	
GSX 25	54800	27400	2350	5500	750	190	NM 25 X 25	0,40	0,20	2600	4700	
GSX 30	64000	28750	2650	6100	850	280	NM 30 X 32	0,50	0,25	2200	4300	
GSX 40	101000	42800	3200	7250	950	550	NM 40 X 55	0,70	0,35	1800	3300	
GSX 50	125700	46450	3700	8800	1250	950	NM 50 X 85	0,90	0,45	1500	3000	

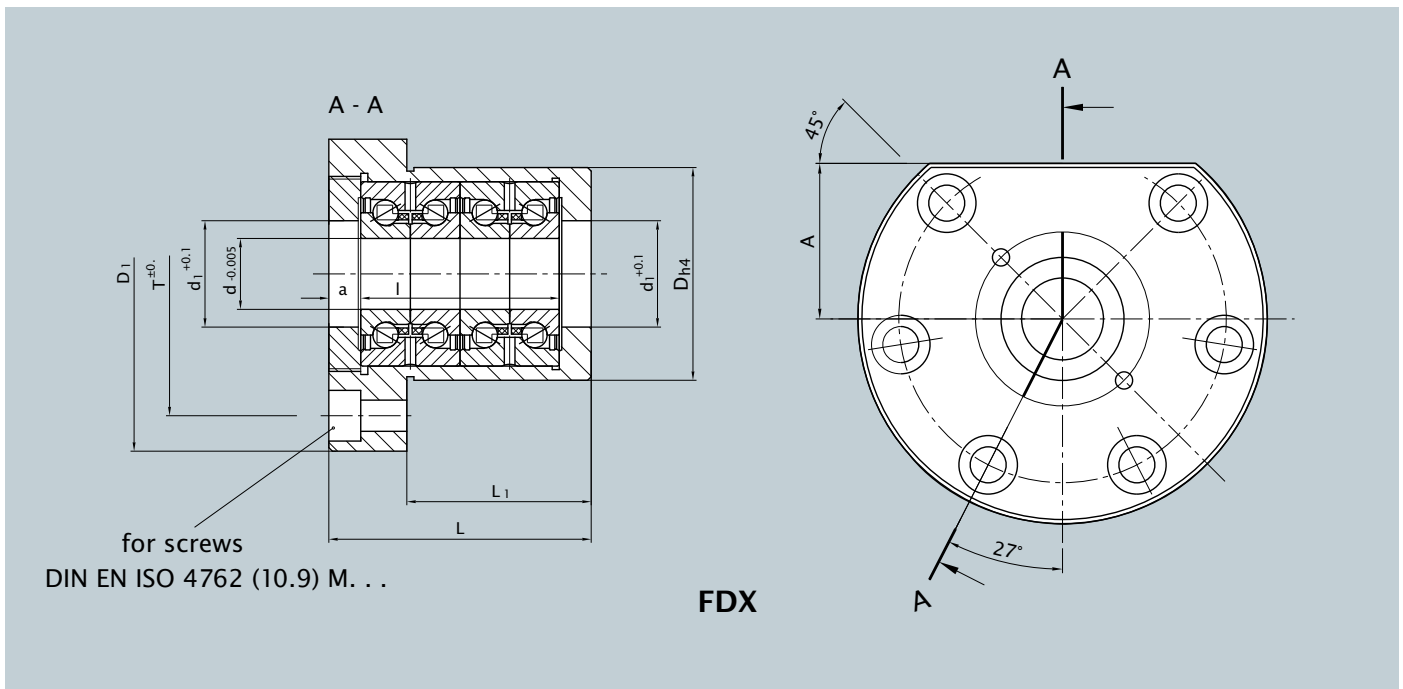
Series FSX



UKF Type											Drilled and Countersunk		M _{AS} Nm	kg
	d	d ₁	D	D ₁	L	L ₁	l	a	A	T	Size	Number		
FSX 12	12	20	50	80	40	27	25	8	30	65	M6	6 x 54°	14	0,83
FSX 15	15	25	55	85	41	28	25	8	32	70	M6	7 x 45°	14	0,85
FSX 20	20	30	60	100	46	29	28	9	38	80	M8	6 x 54°	35	1,32
FSX 25	25	37	80	120	49	32	28	11	45	100	M8	6 x 54°	35	2,14
FSX 30	30	43	80	120	49	32	28	11	45	100	M8	7 x 45°	35	2,04
FSX 40	40	51	90	130	58	32	34	12	49	108	M10	7 x 45°	69	2,99
FSX 50	50	64	110	150	58	34	34	12	56	128	M10	8 x 33° 45'	69	4,10

UKF Type	Ratings		Axial Preload F _V N	Separating-force F _d N	Axial rigidity R _a N/μm	Tilting rigidity R _T Nm/mrad	Lock Nut Type	Seating torque M _A Nm	Friction torque		Speed Limit	
	C ₀ N	CN							M _A Nm	2RS	2Z	n _{lim} rpm
FSX 12	24650	16900	960	2200	370	50	NM 12 X	8	0,16	0,08	3800	7600
FSX 15	27900	17850	1070	2450	400	65	NM 15 X	10	0,20	0,10	3500	7000
FSX 20	46850	25900	2050	4750	650	135	NM 20 X	18	0,30	0,15	3000	5400
FSX 25	54800	27400	2350	5500	750	190	NM 25 X	25	0,40	0,20	2600	4700
FSX 30	64000	28750	2650	6100	850	280	NM 30 X	32	0,50	0,25	2200	4300
FSX 40	101000	42800	3200	7250	950	550	NM 40 X	55	0,70	0,35	1800	3300
FSX 50	125700	46450	3700	8800	1250	950	NM 50 X	85	0,90	0,45	1500	3000

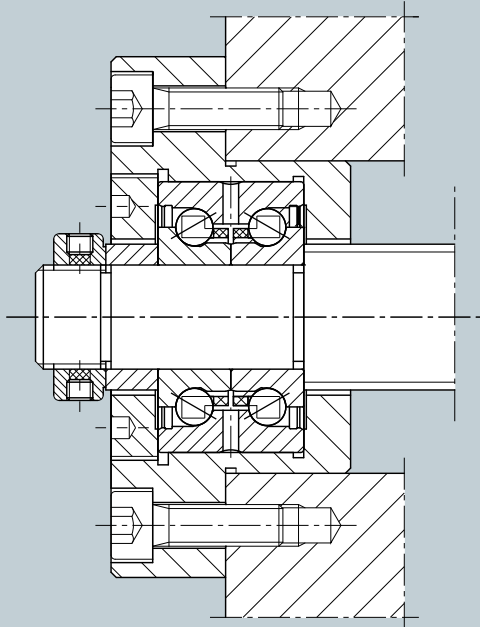
Series FDX



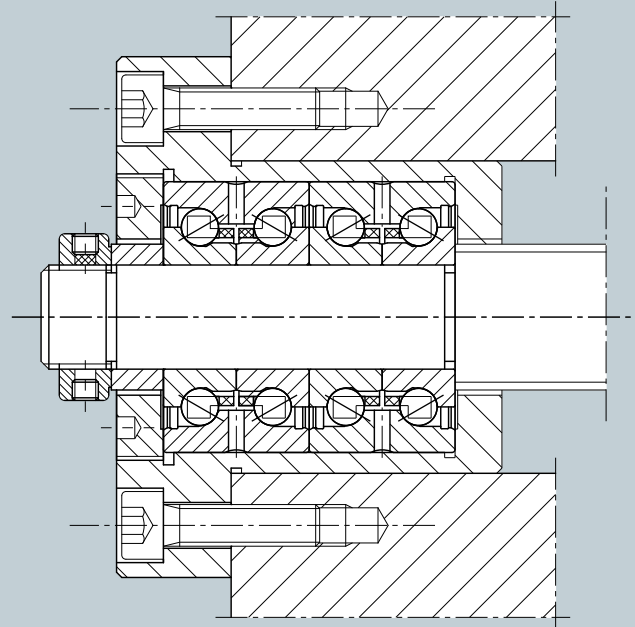
UKF Type											Drilled and Countersunk		M _{AS} Nm	kg
	d	d ₁	D	D ₁	L	L ₁	l	a	A	T	Size	Number		
FDX 12	12	20	50	80	65	47	50	8	30	65	M6	6 x 54°	14	1,15
FDX 15	15	25	55	85	66	48	50	8	32	70	M6	7 x 45°	14	1,31
FDX 20	20	30	60	100	74	52	56	9	38	80	M8	6 x 54°	35	1,79
FDX 25	25	37	80	120	77	55	56	11	45	100	M8	6 x 54°	35	3,20
FDX 30	30	43	80	120	77	55	56	11	45	100	M8	7 x 45°	35	3,01
FDX 40	40	51	90	130	92	64	68	12	49	108	M10	7 x 45°	69	4,12
FDX 50	50	64	110	150	92	64	68	12	56	128	M10	8 x 33° 45'	69	5,80

UKF Type	Ratings		Axial Preload F _v N	Separating-force F _d N	Axial rigidity R _a N/μm	Tilting rigidity R _T Nm/mrad	Lock Nut Seating torque M _A Nm		Friction torque M _A Nm		Speed Limit n _{lim} rpm	
	C ₀ N	CN					2RS	ZZ	2RS	ZZ		
	FDX 12	49300	27400	960	4400	615	110	NM 12 X	8	0,25	0,16	3400
FDX 15	55800	28900	1070	4900	700	145	NM 15 X	10	0,30	0,20	3100	5600
FDX 20	93500	42000	2050	9500	1150	310	NM 20 X	18	0,45	0,3	2700	4300
FDX 25	109500	44300	2350	11000	1300	430	NM 25 X	25	0,60	0,40	2300	3700
FDX 30	128000	46500	2650	12200	1500	580	NM 30 X	32	0,75	0,5	2000	3400
FDX 40	202000	69300	3200	14500	1650	1200	NM 40 X	55	1,05	0,7	1600	2600
FDX 50	251000	75200	3700	17600	2200	2250	NM 50 X	85	1,35	0,9	1300	2400

Design Examples

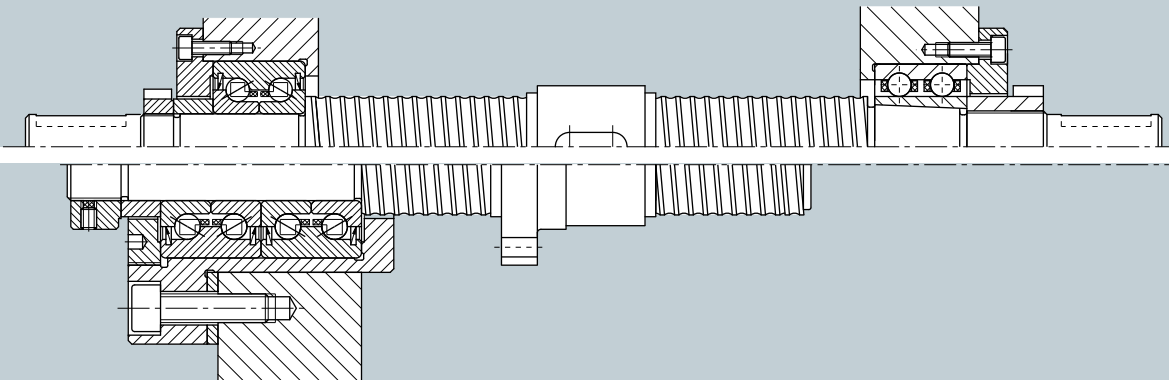


FSX



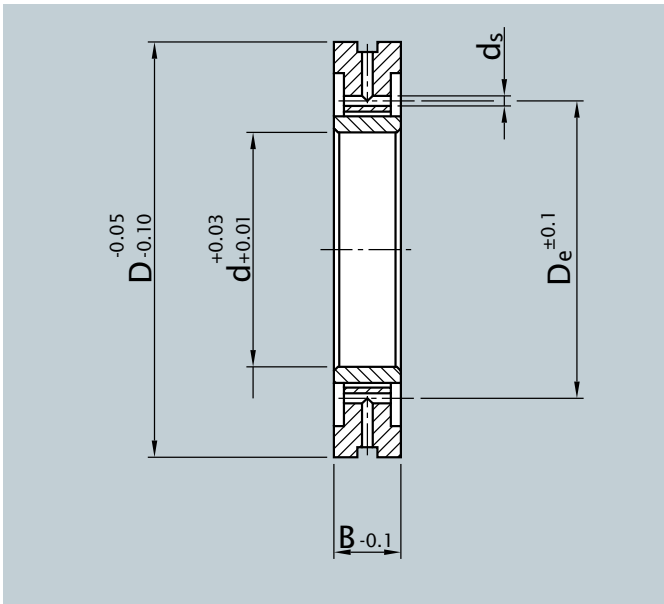
FDX

both ends supported with bearings GSX and AF.. (Floating Bearing)



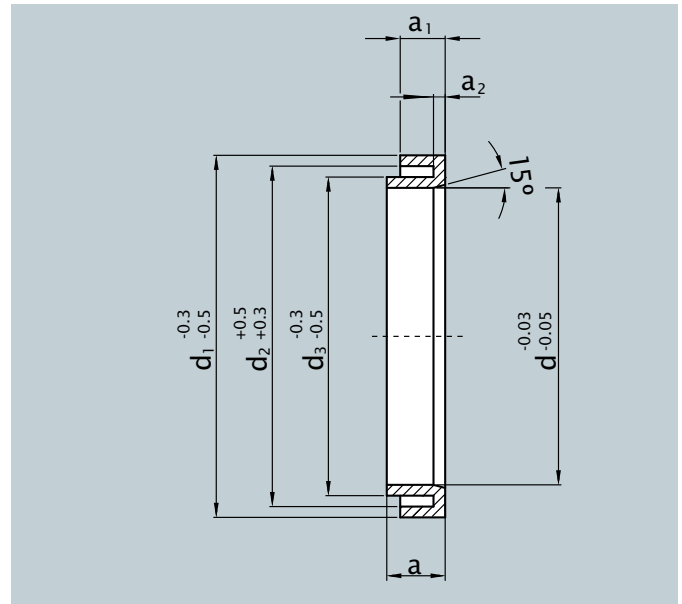
only one end supported with bearings (cantilevered); Bearing Cartridge FDX

UKF Distance Ring DR



for mounting the bearings with a specified separation, complete with lubricant port and grease reservoir. Compatible with types 719/70 UHS resp. UHC

UKF Splash Ring SR



designed for shrink fit onto the shaft; contours match the labyrinth seals of our Bearing Cartridges; heat ring to expand for installation.

Dimensions in mm

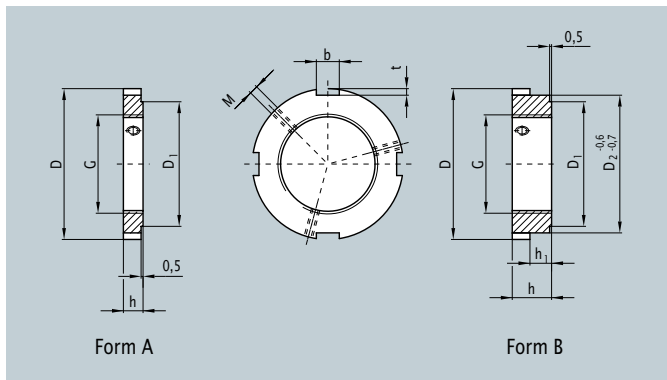
UKF Type	d	B _{min} *	Series 719			Series 70		
			D	D _e	d _s	D	D _e	d _s
DR 20	20	10	37	26,1	1,2	42	28,3	1,4
DR 25	25	10	42	31,1	1,2	47	33,3	1,4
DR 30	30	10	47	36,1	1,2	55	39,3	1,4
DR 35	35	10	55	42,7	1,2	62	44,6	1,4
DR 40	40	12	62	48,2	1,5	68	50,7	1,7
DR 45	45	12	68	53,8	1,5	75	56,0	1,7
DR 50	50	12	72	58,2	1,5	80	61,0	1,7
DR 55	55	12	80	64,3	1,5	90	68,2	1,7
DR 60	60	12	85	69,4	1,5	95	73,3	1,7
DR 65	65	12	90	74,5	1,5	100	78,3	1,7
DR 70	70	15	100	81,4	1,5	110	84,7	1,7
DR 75	75	15	105	86,4	1,5	115	89,7	1,7
DR 80	80	15	110	91,5	1,8	125	96,8	2,0
DR 85	85	15	120	97,8	1,8	130	101,9	2,0
DR 90	90	15	125	102,9	1,8	140	109,0	2,0
DR 100	100	18	140	114,9	1,8	150	119,0	2,0
DR 110	110	18	150	124,9	1,8	170	132,6	2,0
DR 120	120	18	165	136,9	1,8	180	142,6	2,0
DR 130	130	18	180	148,5	2,0	200	156,3	2,2
DR 140	140	18	190	158,5	2,0	210	166,3	2,2
DR 150	150	18	210	172,8	2,0	225	177,9	2,2

Dimensions in mm

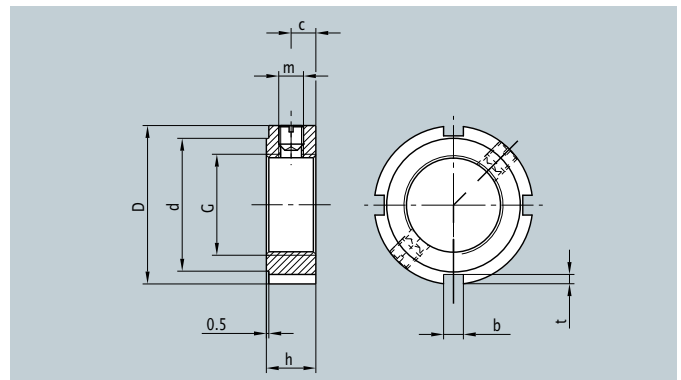
UKF Type	d	d ₁	d ₂	d ₃	a	a ₁	a ₂
SR 25	31	35	39	45	9,8	6,5	2
SR 30	36	42	47	53	11,3	7,5	2
SR 35	42	46	51	57	11,3	7,5	2
SR 40	48	52	57	63	11,3	7,5	2
SR 45	53	57	63	69	11,8	6,5	2,5
SR 50	60	65	71	77	13,8	7,5	2,5
SR 55	65	69	75	81	14,3	8,5	2,5
SR 60	70	75	82	89	14,3	8,5	2,5
SR 65	75	82	88	94	16,8	10	3
SR 70	80	86	92	99	16,8	10	3
SR 75	85	92	98	105	16,8	10	3
SR 80	92	100	106	113	17,7	10	3
SR 85	97	103	109	116	17,7	10	3
SR 90	102	112	118	126	16,7	10	3
SR 95	109	116	123	130	16,7	10	3
SR 100	114	124	131	139	17,7	11	3
SR 105	119	130	136	144	17,7	12	4
SR 110	128	137	144	152	19,7	12	5
SR 120	139	147	153	161	16,7	12	5
SR 130	150	160	168	178	18,7	12	5
SR 140	160	170	180	190	21,7	13	5
SR 150	175	185	195	206	22,7	13	5

*) Specify Bearing Type and required span width

UKF Lock Nuts NMA, NMB



NMX



Lock Nut NM

Lock Nuts provide an easy and secure axial fastening of bearings on a shaft. Form A needs less space; Form B is also ideal for fastening Bearing Cartridges.

Both have, depending on the size, two or three radial set screws for securing.

Form X is mainly used if higher axial forces occur, e. g., Support of Ball Screws. They have two set screws to guard against loosening.

Dimensions in mm

UKF Type	G	D	d ₁	h	c	m	b	t
NM 12X	M12 x 1	22	18	8	4	M4	3	2
NM 15X	M15 x 1	25	21	8	4	M4	3	2
NM 20X	M20 x 1	32	27	10	5	M5	4	2
NM 25X	M25 x 1,5	38	33	12	6	M6	5	2
NM 30X	M30 x 1,5	45	40	12	6	M6	5	2
NM 40X	M40 x 1,5	58	52	14	7	M6	6	2,5
NM 50X	M50 x 1,5	70	64	14	7	M6	6	2,5

Dimensions in mm

UKF Type	G	D	D ₁	D ₂	h		h ₁	b	t	M
					A	B				
NM 25	M25 x 1,25	39	31	35	6	12	6	6	2	
NM 30	M30 x 1,25	46	38	42	6	12	6	7	2	M4
NM 35	M35 x 1,25	51	43	46	6	12	6	7	2,5	2 x 180°
NM 40	M40 x 1,25	58	48	52	6	13	7	8	3	
NM 45	M45 x 1,25	63	53	57	7	14	7	8	3	
NM 50	M50 x 1,25	71	58	65	7	15	8	8	3	M5
NM 55	M55 x 1,25	74	65	69	7	16	9	10	2,5	2 x 180°
NM 60	M60 x 1,25	81	70	75	8	17	9	10	3	
NM 65	M65 x 1,25	89	75	82	8	18	10	10	3,5	
NM 70	M70 x 1,25	94	80	86	8	18	10	10	4	M6
NM 75	M75 x 1,25	99	85	92	8	18	10	10	3,5	3 x 120°
NM 80	M80 x 1,25	107	92	100	8	18	10	10	3,5	
NM 85	M85 x 1,25	111	97	103	9	20	11	10	4	
NM 90	M90 x 1,25	120	102	112	9	20	11	10	4	
NM 95	M95 x 1,25	125	109	116	10	22	13	12	4,5	
NM 100	M100 x 1,25	134	114	124	10	25	14	12	5	
NM 105	M105 x 1,5	140	119	130	10	26	14	12	5	
NM 110	M110 x 1,5	147	124	137	11	26	14	12	5	M8
NM 120	M120 x 1,5	157	134	147	12	26	15	12	5	3 x 120°
NM 130	M130 x 1,5	170	144	160	12	28	15	12	5	
NM 140	M140 x 1,5	180	156	170	12	28	15	12	5	
NM 150	M150 x 1,5	195	166	185	12	28	15	12	5	

Special Designs and Configurations

The UKF Range of Products enables us to offer a variety of modifications to complement the Standard Types.

In lieu of the standard, fibre cage, **solid cages** (of brass or special plastic material) with dry-running capability for emergency cases are available. Of special interest are cages of Polyetheretherketon (PEEK), a thermoplastic reinforced by carbon fibre, and noted for high wear and temperature resistance, combined with good sliding properties.

UKF Spindle Bearings can be made with a **coated surface**, for maintenance-free applications and extreme conditions, e. g., vacuums and space.

UKF Bearings and Bearing Cartridges can even be manufactured in larger sizes than shown in the tables: up to a **max. O.D. of 380 mm**.

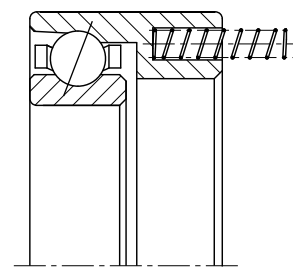
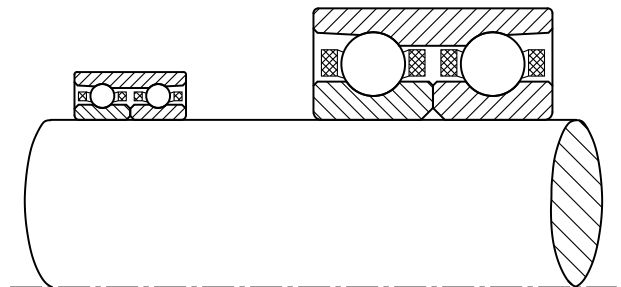
Specially designed bearings with **modified grooves**, contoured to provide line contact, attain significantly higher load capacity. An example are bearings used for smoothly adjusting transmission assemblies, even under higher working forces.

Slim-line Spindle Bearings, double row and preloaded, with solid cage for very constrained spaces, e. g., **d = 62, D = 74, form USO**.

Within the dimensions of an USO-Type Bearing (i. e., a pair of Single Row Bearings) a special construction is available to place the bearing under an elastic preload using compression springs. Forces and numbers of springs are in accordance with the requirements.

To guard against corrosion, the bushings and cover plates can be plated: hard chrome, electro-less nickel, etc. Working forces can be monitored with sensors at the bearings. UKF Bearing Cartridges with integrated **sensor for working forces** boast the same standard dimensions as the regular models, with only the addition of a connecting cable!

The **variable preload** system, UKF VARIORING, can be integrated into Bearing Cartridges "LKSO/LKSS".



Calculations

Nominal bearing life L_h

In order to determine the nominal bearing life, L_h , of a bearing arrangement, the value of the dynamic load, f_L , must first be calculated.

$$f_L = \frac{C}{P} \cdot f_n$$

f_L = symbol for the dynamic load
 C = dynamic load rating [N]
 P = dynamic equivalent load [N]
 f_n = speed factor

$$= \sqrt[3]{\frac{100/3}{n \cdot \min}}$$

With the calculated value for f_L , the nominal bearing life L_h in hours can be determined from the table below. This is in accordance with the International Standard (DIN ISO 281) for a bearing failure rate probability of 10 %.

The actual length of services of a bearing, i. e., the running time in hours, depends on several factors. One factor is the operational running condition, e. g., flawless lubrication and prevention of any contamination, including coolants or debris. Finally, a perfect installation is an absolute necessity.

Nominal bearing life L_h

f_L	L_h (h)	f_L	L_h (h)
1,00	500	2,71	10000
1,26	1000	2,88	12000
1,59	2000	3,04	14000
1,82	3000	3,17	16000
2,00	4000	3,30	18000
2,22	5000	3,42	20000
2,29	6000	3,68	25000
2,41	7000	3,91	30000
2,52	8000	4,12	35000
2,62	9000	4,31	40000
		4,64	50000

Intermediate values can be found with the following equation: $L_h = 500 \text{ h} \cdot f_L^3$

f_L values for spindle bearings and angular contact ball bearings

The f_L -values are based on many years of experience, and are meant to serve as a guideline for new designs.

application	f_L
turning and milling spindles	3,0 - 4,5
drilling spindles	3,0 - 4,0
grinding spindles	2,5 - 3,5
work head spindles	3,5 - 4,5
centrifuges	2,5 - 3,0
circular saws	2,0 - 3,0
coating machines	3,0 - 4,0
spindles for machining centres	3,5 - 4,5

Dynamic rating C of bearing groups

For grouped bearings, factor f_i is to be taken into consideration.

$$C_{\text{group}} = f_i \cdot C_{\text{single}} \text{ [N]}$$

$$f_i = i^{0,7}$$

i = number of bearings

i	2	3	4
f_i	1,62	2,16	2,64

In applications, where bearings of type USS are to be combined with type USO, in tandem-O-arrangements, the dynamic rating of bearing type USS is to be considered according to the following equation:

$$C_{\text{group}} = 2,36 \cdot C_{\text{USS}}$$

By following this guidance, allowance is made for the fact that due to the even load distribution, the rating of bearing type USO is higher than a pair of single bearings, type USS. Also in the case of double row or quadruple row bearing arrangements, USO type bearings should be preferred to single row bearings.

$$C_{\text{group}} = 1,62 \cdot C_{\text{USO}} \text{ for precision class UKF I/I and UKF 1/1}$$

$$C_{\text{group}} = 1,80 \cdot C_{\text{USO}} \text{ for precision class 0/0}$$

Dynamic equivalent load P

The dynamic equivalent load P is a compensation load for the bearing-life calculation. The dynamic equivalent load can be considered as a constant radial loading, in magnitude and direction, under which a comparably loaded anti-friction bearing would actually reach the same life limit.

$$P = X \cdot F_r + Y \cdot F_a$$

P = dynamic equivalent load [N]

F_r = radial load of the bearing [N]

F_a = thrust load of the bearing [N]

X = radial factor

Y = axial factor

Factors X and Y are dependant on the contact angle. Increasing thrust load results in an increase of the ball contact angle, a (pressure angle). Hence, the thrust factor Y and the limiting value e depend on the ratio $f_0 \cdot F_a/C_0$, at least in the case of a small contact angle ($\alpha < 20^\circ$). For Bearings with a nominal contact angle of $\alpha = 20^\circ$, the variation of the ball contact angle resulting from higher thrust loads is negligible. The radial factors as well as the thrust factors can be taken from the tables below.

f_0 = factor according to DIN ISO 76 taken from table below

C_0 = static load rating of the single bearing

i = number of bearings

e = limiting value for F_a / F_r for selection of X and Y factors.

Series 719 USO, 70 USO, LK SO, PLK SO series 719 USS, 70 USS in O- oder X-arrangement (contact angle $\alpha = 21^\circ$)

e	$F_a/F_r \leq e$		$F_a/F_r > e$	
	X	Y	X	Y
0,57	1	1,09	0,70	1,63

Series 719 USS, 70 USS as a single bearing or in tandem arrangement (contact angle $\alpha = 21^\circ$)

e	$F_a/F_r \leq e$		$F_a/F_r > e$	
	X	Y	X	Y
0,57	1	0	0,43	1

Series 719 UHS/UHC... - A 15, 70 UHS/UHC...-A15 (contact angle $\alpha = 15^\circ$)

as a single bearing or in tandem arrangement

$f_0 \cdot F_a / C_0$	e	$F_a/F_r \leq e$		$F_a/F_r > e$	
		X	Y	X	Y
0,3	0,40				1,40
0,5	0,43				1,31
0,9	0,45				1,23
1,6	0,48	1	0	0,44	1,16
3,0	0,52				1,08
6,0	0,56				1,00

for paired bearings in O or X arrangement

$f_0 \cdot F_a / C_0$	e	$F_a/F_r \leq e$		$F_a/F_r > e$	
		X	Y	X	Y
0,3	0,40		1,56		2,26
0,5	0,43		1,47		2,15
0,9	0,45		1,38		2,02
1,6	0,48	1	1,31	0,72	1,90
3,0	0,52		1,21		1,78
6,0	0,56		1,12		1,63

Series 719 UHS/UHC... - A 25, 70 UHS/UHC...-A25 (contact angle $\alpha = 25^\circ$)

as a single bearing or in tandem arrangement

e	$F_a/F_r \leq e$		$F_a/F_r > e$	
	X	Y	X	Y
0,68	1	0	0,41	0,87

for paired bearings in O or X arrangement

e	$F_a/F_r \leq e$		$F_a/F_r > e$	
	X	Y	X	Y
0,68	1	0,92	0,67	1,41

Calculation Principles

Factor f_0 for series 719 UHS/UHC...-A 15, 70 UHS/UHC...-A 15 (contact angle $\alpha = 15^\circ$)

d mm	factor f_0		d mm	factor f_0	
	719 UHS/UHC	70 UHS/UHC		719 UHS/UHC	70 UHS/UHC
20	15,5	15,2	75	16,1	16,5
25	16,0	15,7	80	16,0	16,5
30	16,4	15,7	85	16,2	16,4
35	16,4	16,0	90	16,1	16,4
40	16,5	16,4	100	16,1	16,3
45	16,3	16,4	110	16,0	16,4
50	16,2	16,5	120	16,0	16,3
55	16,3	16,5	130	16,1	16,5
60	16,2	16,5	140	16,0	16,4
65	16,1	16,4	150	16,1	16,4
70	16,1	16,5			

Series K, UK, UL, UM, LK, PLK, LS

$\frac{2F_a}{C_0}$	e	F_a/F_r e		F_a/F_r e	
		X	Y	X	Y
0,02	0,39		1,62		2,36
0,03	0,40		1,57		2,28
0,04	0,41		1,53		2,22
0,06	0,43		1,46		2,11
0,08	0,45	1	1,41	0,72	2,03
0,10	0,47		1,37		1,97
0,15	0,49		1,29		1,86
0,20	0,52		1,23		1,76
0,30	0,55		1,14		1,66
0,50	0,56		1,12		1,63

Resultant thrust load

With preloaded spindle bearings, the resulting axial load is the reaction thrust load and the preload itself.

- $F_a = Y_1 F_{ab} + Y_2 F_v$
- F_a = resulting thrust load [N]
- F_{ab} = external thrust load (operational load) [N]
- F_v = preload [N]
- Y_1, Y_2 = correction factors

load direction	preload	F_{ab}/F_v	Y_1	Y_2
radial ¹⁾	rigid or elastic (deflection)	---	0	1
axial	rigid	3	2/3	1
		> 3	1	0
axial	elastic (deflection)	---	1	1

¹⁾ valid only for pure radial load.

Combined loads

Applications in which varying loads and / or speeds occur, the mean dynamic equivalent load P_m must be calculated, with respect to the respective duration of each individual running condition.

- $P_m = \sqrt[3]{(P_1^3 \cdot n_1 \cdot q_1 + P_2^3 \cdot n_2 \cdot q_2 + \dots + P_n^3 \cdot n_n \cdot q_n) / (n_m \cdot 100\%)}$
- $n_m = (n_1 \cdot q_1 + n_2 \cdot q_2 + \dots + n_n \cdot q_n) / 100\%$
- P_m = mean dynamic equivalent load [N]
- n_m = mean speed [rpm]
- $P_1 \dots P_n$ = dynamic equivalent loads of the individual running conditions [N]
- $n_1 \dots n_n$ = speeds of the individual running conditions [rpm]
- $q_1 \dots q_n$ = periods of time of the respective running conditions [%]

Attainable speeds

The attainable speed or permissible speed, respectively, of a bearing arrangement depends on many factors which have a decisive influence on the limiting speed. Therefore, only the most important ones, which can easily be calculated, are discussed.

- $n_{max} = f_1 \cdot f_2 \cdot f_3 \cdot n_{lim}$
- n_{max} = maximum attainable speed [rpm]
- n_{lim} = limiting speed to be taken from the table [rpm]
- f_1 = precision factor
- f_2 = preload factor
- f_3 = arrangement factor

precision	f_1	preload	f_2
UKF HQ/0	UKF HQ/I	1,00	
UKF 0/0	UKF 0/I	1,00	
UKF I/I	UKF 1/1	0,80	
UKF 1/2 ¹⁾		0,75	
		L	1,00
		M	0,85
		S	0,65
		VARIORING	1,00...0,65

¹⁾ for series K, UK, UL, UM

bearing arrangement with single row bearings	f_3
	1,00
	0,95
	0,90
	0,75
	0,85
with double row ISO bearings (TBT) and QBC combined with USS	
DB	1,00
TBT	0,90*
QBC	0,85*

* with respect to n_{lim} of the ISO bearing

Static loading

Index of static stressing f_s

The index of static stressing f_s is a safety factor, against prohibitive permanent deformations at the contact areas of balls. Since spindle bearings are required to perform well above the standards of general machine construction, the index of static stressing should be higher than 2,5

$$f_s = \frac{i \cdot C_0}{P_0}$$

- f_s = index of static stressing
- C_0 = static load rating of the single bearing [N]
- i = number of bearings
- P_0 = static equivalent load [N]

Static equivalent load P_0

The static equivalent load is assessed by the equations:

- $P_0 = X_0 \cdot F_r + Y_0 \cdot F_a$ und $P_0 = F_r$
- The higher of the two values is to be used.
- P_0 = static equivalent load [N]
- F_r = radial load of the bearing [N]
- F_a = thrust load of the bearing [N]
- X_0 = radial factor
- Y_0 = axial factor

The factors X_0 and Y_0 depend on the contact angle and the arrangement of the bearings.

Series 719 USS, 70 USS as a single bearing or in tandem arrangement (contact angle $\alpha = 21^\circ$)

- $X_0 = 0,5$ $Y_0 = 0,41$

Series 719 USO, 70 USO, P/LK SO ...2DB, series 719 USS, 70 USS in O- or X arrangement

- $X_0 = 1$ $Y_0 = 0,82$

Series 719 UHS / UHC...-A 15, 70 UHS / UHC ...-A 15 (contact angle $\alpha = 15^\circ$)

as a single bearing or in tandem arrangement

- $X_0 = 0,5$ $Y_0 = 0,46$

for paired bearings in O or X arrangement

- $X_0 = 1$ $Y_0 = 0,92$

Series 719 UHS / UHC...-A 25, 70 UHS / UHC ...-A 25 (contact angle $\alpha = 25^\circ$)

as a single bearing or in tandem arrangement

- $X_0 = 0,5$ $Y_0 = 0,38$

for paired bearings in O or X arrangement

- $X_0 = 1$ $Y_0 = 0,76$



Part Number Designation for UKF Spindle Bearings and Angular Contact Ball Bearings with Spacer Balls

	70	USO	65.	2DB.	A21.	1/1.	S	ZZ.
XH	719	USSC	120.	DT.	A21.	O/I.	M	.
	70	UHC	70.	DB.	A15.	O/I.	L	LB.
	70	AFDC	40.		-	I/1.		
	UL		30.		A16.	I/1.		
	GSX		25.		A60.	O/I.		2RS.

Prefix	
XH	CRONIDEX®

Dimension Series	
718	Ultra Light (on request)
719	Light
70	Medium

Type Series	
Spindle Bearings/Hybrid Spindle Bearings	
USS	Standard Spindle Bearings single row, Steel Balls
USO	Standard Spindle Bearings double row DB, Steel Balls
USSC	Hybrid Spindle Bearings single row, Ceramic balls
USOC	Hybrid Spindle Bearings double row DB, Ceramic balls
High Speed-/Hybrid-Spindle Bearings	
UHS	High Speed Spindle Bearings single row, Steel balls
UHC	HS-Hybrid Spindle Bearings single row, Ceramic balls
Floating Bearings with cylindrical raceways on Inner Ring, ceramic balls	
AFSC	single row
AFDC	double row
Angular Contact Precision Bearings with Spacer Balls	
K/UK	internal standard, dimensional series 02, Series 70
UL	dimensional 02, Series 72
UM	dimensional 02, Series 73

Bearing Arrangement	
Bearing Sets as at page 4	

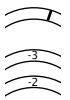
Bore d in mm	
--------------	--

Options	
2 Z	(or ZZ) shields, with gap to I.R.
2RS	lip seals / groove seals
LB	lubrication bore through Outer Ring

Preload	
L	light
M or without designation	= medium
S	heavy
alternative: individual preload as per agreement	

Precision class	
HQ	better than at present given Standard
O	better than ISO 2, P2, ABEC 9
I	better than ISO4, P4, ABEC 7 (Standard of Spindle Bearings)
1, 1/2	better than ISO5, P5, ABEC 5 (Standard of Spindle Bearings with Spacer Balls)
Frequently precision of rotating Inner Ring is selected one grade higher than the Outer Ring. e. g., O/I (I.R/O.R)	

Additional/Special Requirements	
U	= Single Bearing, universal
DU	= Set of two, universal
marked	radial runout Outer Ring
Difference I.D. resp. O.D. to d resp. D	
range of tolerance D/d	D ₁ upper half D ₂ lower half d ₁ upper half d ₂ lower half
and:	
greased	on request
noise checked	on request



Angles of Contact α (of the balls)		
A 21	$\alpha = 21^\circ$	Standard of USS(C), USO(C)
A 15	$\alpha = 15^\circ$, A 25 $\alpha = 25^\circ$ etc.	A15 Standard of UHS, UHC
A 16	$\alpha = 16^\circ$	A16 Standard of K, UK, UL, UM
A ...		Custom contact angles $12^\circ \dots 30^\circ$ as per agreement

Part Number Designation of UKF Bearing Cartridges

LK	SS	70.	TBT.	A21.	0/I.	S.	FA/2Z
LKS	OC	50.	2DB.	A21.	I/1.	L.	VR
PLK	HC	45.	DB.	A15.	HQ/0.	L.	XH/WK
PLK	LS	60.	2DF.	A16.	I/1.	M.	VS
FDX		40.	2DF.	A60.	0/1.	M.	2RS

Layout	
LK...	with flange Bearings Series 70
PLK...	with collar Bearings Series 719
FSX	Ball Screw Support double row
FDX	Ball Screw Support 2x double row

Bearing Assemblies	
SS	Spindle Bearings single row
SO	Spindle Bearings double row
SSC	similar single row Hybrid Bearings
SOC	similar double row Hybrid Bearings
HS	High Speed Single Bearings
HC	High Speed Hybrid Bearings
LS	Bearing System 2 x 2 rows with Spacer Balls

Bore d in mm

Bearing Arrangement, examples:	
Bearing Sets as at pages 36...41	
DB	2 Spindle Bearings single row
2DB	2 Spindle Bearings double row
TBT	3 Spindle Bearings
QBC	4 Spindle Bearings
2DF	Bearing System LS

Options	
FA	preloading springs
SL	air purge
TS	sensor for temperature
VS	sensor for vibration
VR	VARIORING (variable preload)
WK	water cooling
XH	bearings of CRONIDEX®-steel
2Z	shields at both sides, with gap
2RS	lip seals at both sides, contacting greased
FT	

Preload	
L	light
M or without designation	= medium
S	heavy
alternative: individual preload as per agreement	

Precision class	
HQ	better than at present given Standard
0	better than ISO 2, P2, ABEC 9
I	better than ISO 4, P4, ABEC 7 (Standard of Spindle Bearings)
1, 1/2	better than ISO 5, P5, ABEC 5 (Standard of Bearings with Spacer Balls)
Frequently the precision of rotating Inner Ring is specified one grade higher than of Outer Ring, e. g., O/I. (I.R/O.R)	

Angles of Contact α (of the balls)	
A 21	$\alpha = 21^\circ$
A 15	$\alpha = 15^\circ$, A 25 $\alpha = 25^\circ$ etc.
A 16	$\alpha = 16^\circ$ (Bearings with Spacer Balls)
A...	Individual angles of contact for Spindle Bearings $12^\circ \dots 30^\circ$ as per agreement

Comparison of Bearing Types, Units of Measurement

Comparison of Bearings based on a size of bore d = 25 mm. Basic Types and additional markings.

NSK-RHP *)	SNFA	GMN *)	SKF *)	INA/FAG *)	UKF
7905... 7905...SN 24 7905...DB 7905...SN24...DB	SEB25... SEB25/NS... SEB25...DD SEB25/NS...DD	S 61905... HYS 61905 S 61905...DB HYS 61905...DB	71905... 71905...HC... 71905...DB 71905...HC...DB	B 71905... HCB 71905... B 71905...DB HCB71905..DB	Basic Types 719 USS 25 ¹⁾ 719 USSC 25 ¹⁾ 719 USO 25 ^{1) 2)} 719 USOC 25 ^{1) 2)}
7005... 7005...SN24 7005...DB 7005...SN24...DB	EX25... EX25/NS... EX25...DD EX 25/NS...DD	S 6005... HYS 6005... S 6005...DB HYS 6005...DB	7005... 7005...HC 7005...DB 7005...HC...DB	B 7005... HCB 7005... B 7005...DB HCB 7005...DB	70 USS 25 ¹⁾ 70 USSC 25 ¹⁾ 70 USO 25 ^{1) 2)} 70 USOC 25 ^{1) 2)}
---	VEB25... VEB25/NS...	---	71905 CE... 71905 CE/HC...	HS 71905... HC 71905...	719 UHS 25 719 UHC 25
---	VEX25... VEX25/NS...	---	7005 CE... 7005 CE/HC	HS 7005... HC 7005...	70 UHS 25 70 UHC 25
---	---	---	---	FD 1005...	70 AFSC 25 70 AFDC 25
---	---	---	---	---	---
1) Angle of contact at an optimum $\alpha = 21^\circ$ (on request $12^\circ \dots 30^\circ$) 2) Double row Bearing in O-arrangement DB					
C A5 V1V --- ---	...1 ...3 --- .../H1 .../XN	C E KH... ---	CD or CE ACD --- ---	C E 2RSD DLR X...	additional markings: A 15 A 25 2Z LB XH...
UKF Angular Contact High Precision Ball Bearings, double row, preloaded, with rotating guidance by Spacer Balls according to Series (...) beginning with bore d				Internal standard (<70): K 20 ... DIN 628-5 (70): UK 20 ... DIN 628-5 (72): UL 15 ... DIN 628-5 (73): UM 17 ...	
Ball Screw Support Bearings , preloaded, double row, sealed Bearing Cartridges with flange double row four rows Fastening:				ZKLN25572RS ZKLF O.R.-Flange	GSX 25 FSX 25 FDX 25 DG... Screw Cover
*) Code for inner diameter d: ...00 = \varnothing 10 mm ...03 = \varnothing 17 mm ...01 = \varnothing 12 mm ...04 = \varnothing 20 mm ...02 = \varnothing 15 mm ...05 = \varnothing 25 mm etc.					

Measurement Units

Inch	mm	Inch	mm	°C	°F
0,00001 (1/4 μ m)	0,00025	0,001	0,025	0°	32°
0,0001	0,0025	0,003	0,075	50°	122°
0,0002	0,005	0,004	0,100	100°	212°
0,0003	0,0075	0,005	0,1125		
0,0004	0,010	0,007	0,18	kp	lb
0,0005	0,013	0,010	0,25	0,454	1
0,0007	0,018	0,015	0,40	1,0	2,203
		0,020	0,50		
		1/32	0,75	N	kp
		1/16	1,5		
		1,0	25,4	1	0,102

UKF Service

Design assistance and after sales consultancy, specific bearing selection, special designs upon request. Evaluation, relubricating of your spare stock bearings.
Reconditioning of used bearing cartridges.

ISO 9001

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