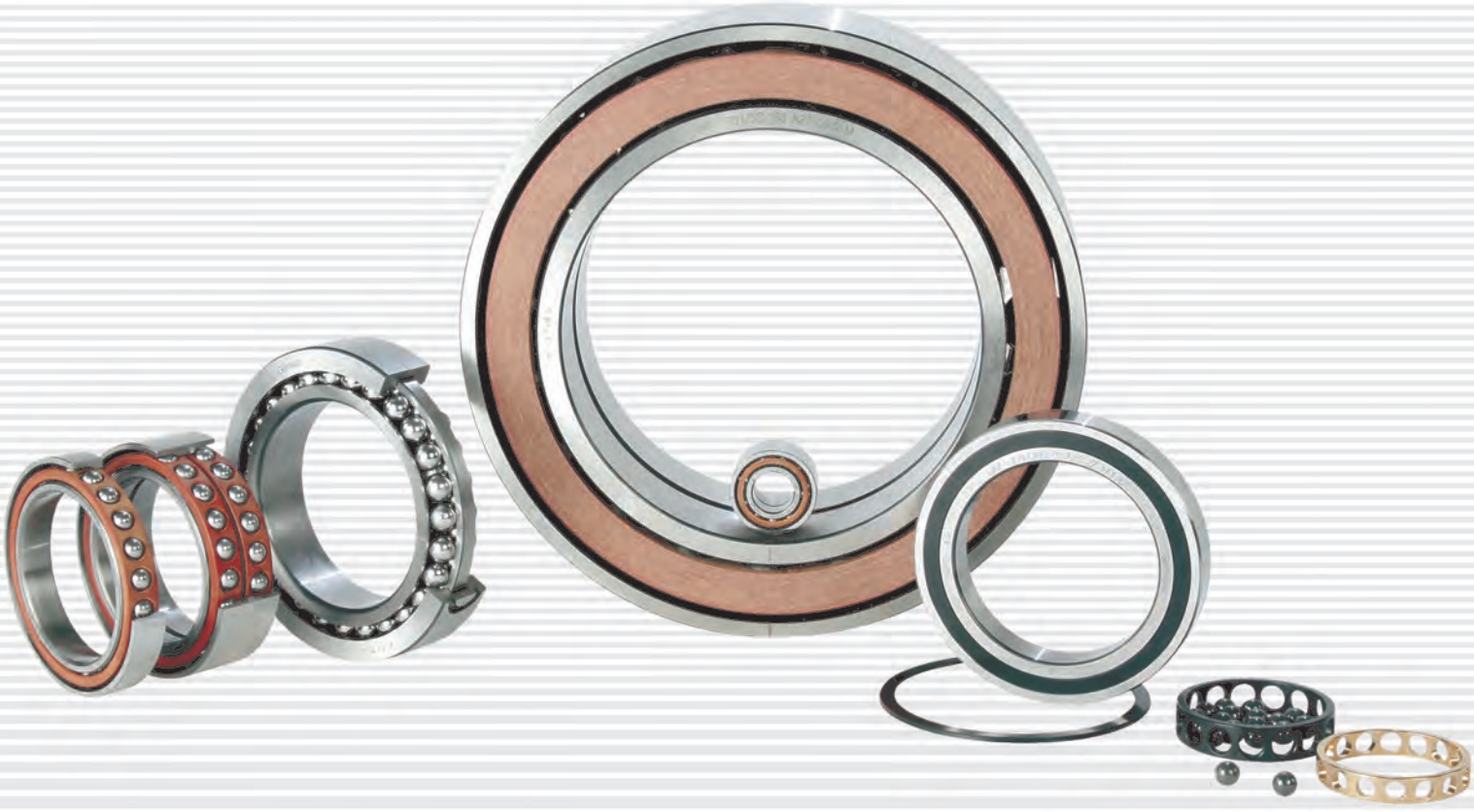
UKF

High Precision Spindle Bearings

Angular Contact Ball Bearings with Spacer Balls

Bearing Cartridges

Ball Screw Support Bearings



www.ukf.de

UKF®

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.

High Precision Spindle Bearings

Angular Contact Ball Bearings with Spacer Balls

Bearing Cartridges

Ball Screw Support Bearings

This catalogue supersedes all previous issues (No. 3180)

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

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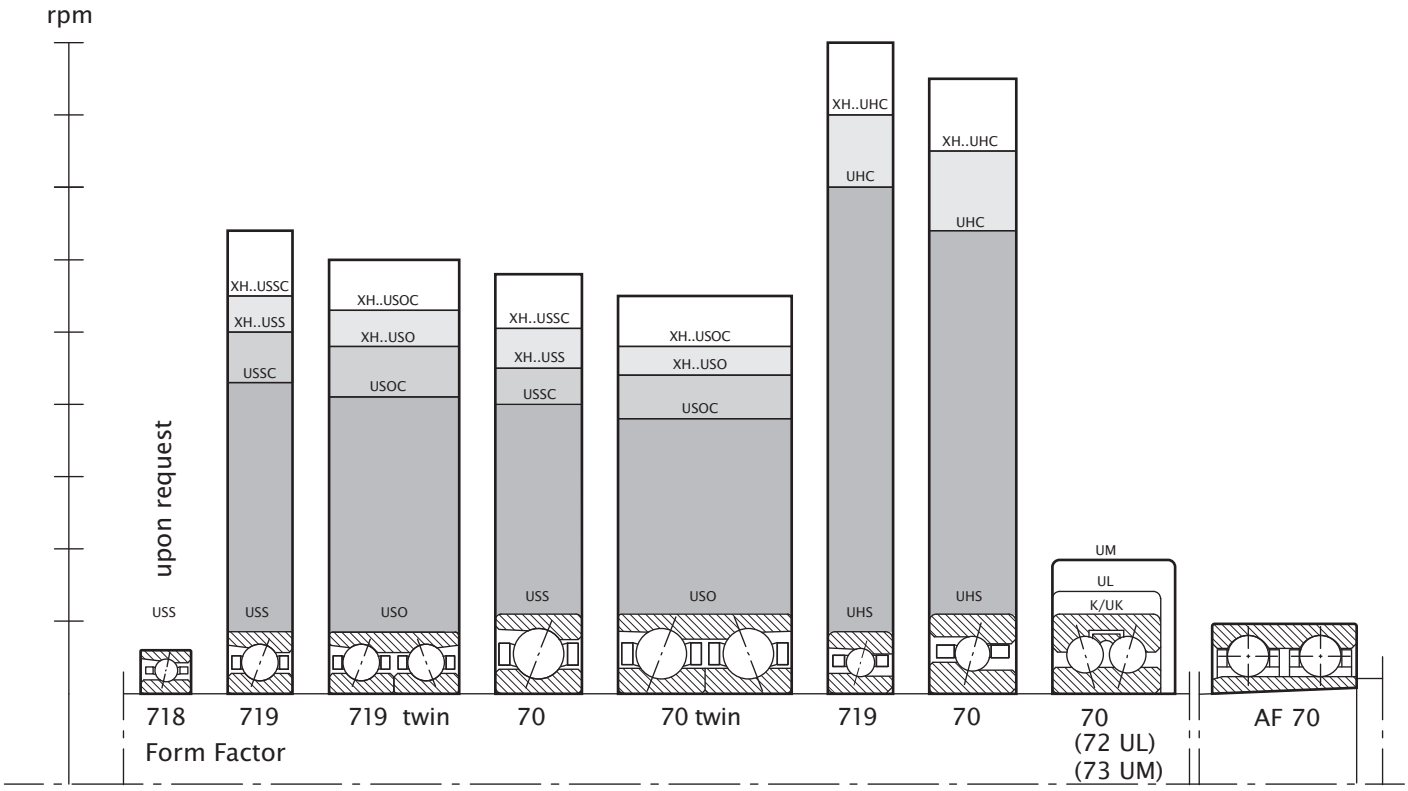
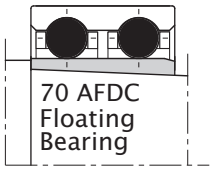
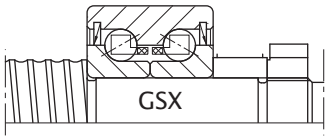
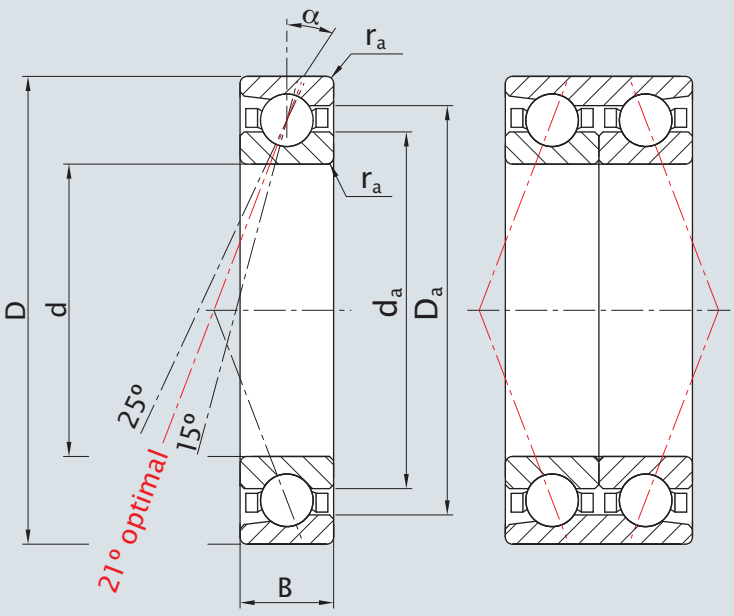
Range of UKF Spindle Bearings







d:	Bore Diameter (I.D.)	mm
D:	Outside Diameter (O.D.)	mm
B:	Width	mm
α:	Contact Angle	degree
d_a: }	matching parts dimensions	
D_a: }		
r_a: }		
C:	Dynamic Load	N
C_o:	Static Load	N
R_a:	Axial Rigidity	N/µm
R_r:	Radial Rigidity	N/µm
m:	Weight	kg
n:	Speed	rpm



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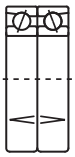
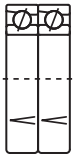
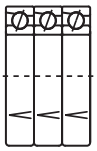
⌀⍁	DB O-Configuration (USO-Type)
⌀⌀	DT Tandem
⍁⌀	DF X Configuration
⌀⌀⌀	TT Triplex
⌀⌀⍁	TBT Tandem-O
⌀⌀⍁⍁	QBC Tandem-O-Tandem
⌀⍁⌀⍁	2DB Double-O
⌀⌀⌀⍁⍁	PBC



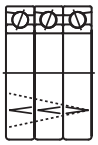
„O-configuration" DB
2 single row or
1 double row bearing (USO Type)



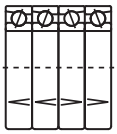
„Tandem" DT

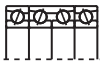


„Triplex" TT

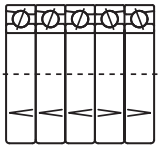


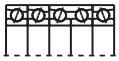
„Tandem-O" TBT
3 single row or
1 single row and
1 double row bearing





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

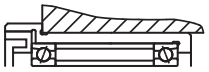




PBC
5 single row or
3 single row and
1 double row bearing

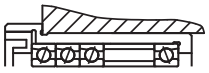
Application Recommendations

Bearing Cartridges

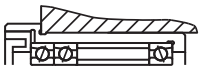


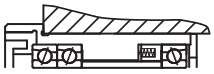
A pair of single bearings, or a double-row bearing in O-configuration (DB). Outstanding parallelism and high running precision, higher stiffness, and simple installation, all by locking the inner rings against each other. Single-piece outer ring is also advantageous for applications requiring a Floating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

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

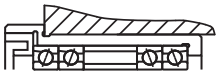


for higher axial forces
and medium speeds, such as drilling

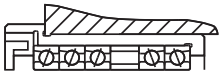




for axial forces with medium or higher speeds, such as Milling, Turning, Fine boring.
Optional: Bearing Set with spring for proper pre-load



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 installed 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.

attuned to each requirement: application-specific preloads

Double Row Bearings with higher stiffness

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 one part, double-row Outer Ring of “USO”-Type Bearings yields higher stiffness even to Bearing Assemblies, such as the TBT and QBC configurations, for example, below.

Stiffness of Bearing Sets					
Bearing assembly		$R_{a\ Set}$	[N/µm]	$R_{r\ Set}$	[N/µm]
⌀⦸	DB		R_a		R_r
⌀⌀	DT	2	R_a		R_r
⌀⌀⦸	TBT	1,83	R_a	1,42	R_r
⌀⌀⦸⦸	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 symmetrical.

For dynamic load capacity, see ”calculation principals”, page 60. relationship between „speed—load capacity—lifetime” is also shown.

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

We stand ready to assist you.

Design with Ceramic Balls (Hybrid Bearings)

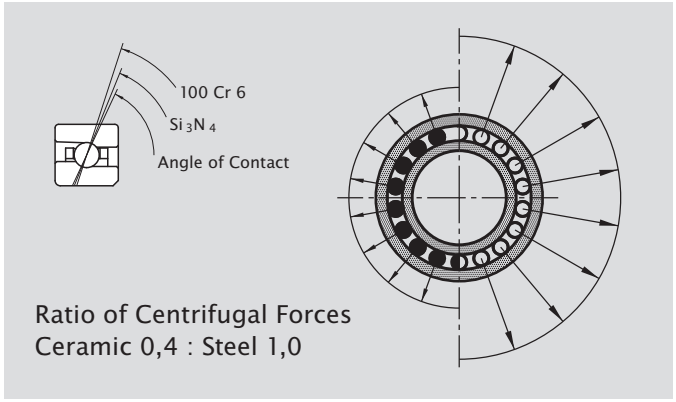
Silicon-Nitride, Si_3N_4, is an exceptionally strong and rigid compound, with merely 40% of the specific gravity of steel. Balls made from this material can operate at both higher speeds, and for longer life cycles. Lower centrifugal forces and lower friction allow reduced wear and lower temperature 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/cm³
Si_3N_4	HV 1600	320 kN/mm	3,2 g/cm³



Ratio of Centrifugal Forces
Ceramic 0,4 : Steel 1,0

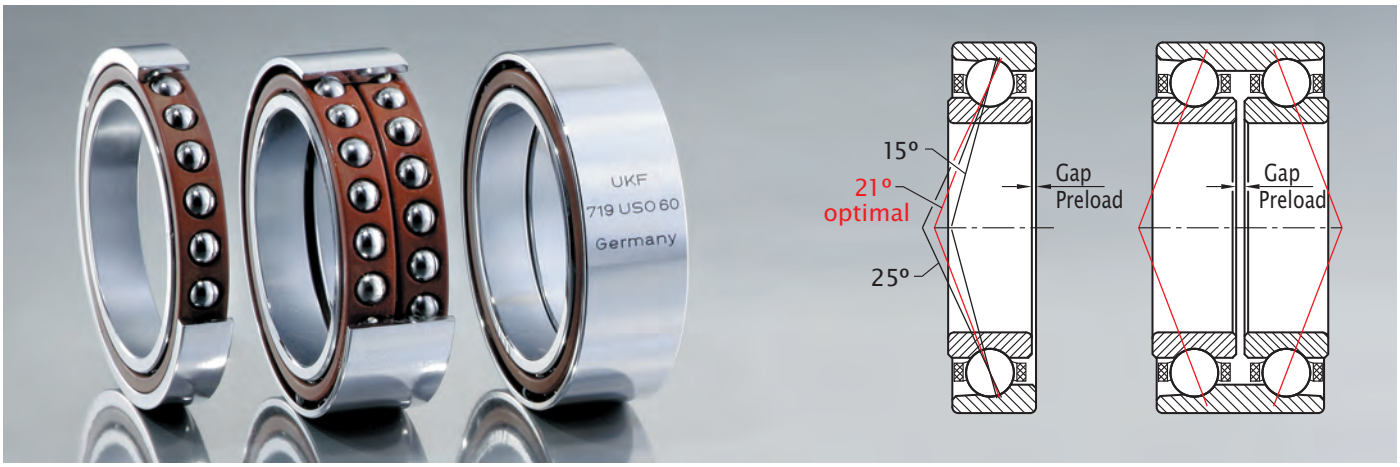
Design "XH" of CRONIDEX®-Steel

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



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 719 and 70, i.e., dimension series 19 and10, 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.

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

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, α = 21°, instead of 15° or 25°, facilitates both production and spares inventories and logistics.

Options

Special Contact Angles, ranging from 12° to 30°, as per agreement. Bearings with integral shields → page 28

Lubrication feed, through the outer ring, directly into the raceway → page 28

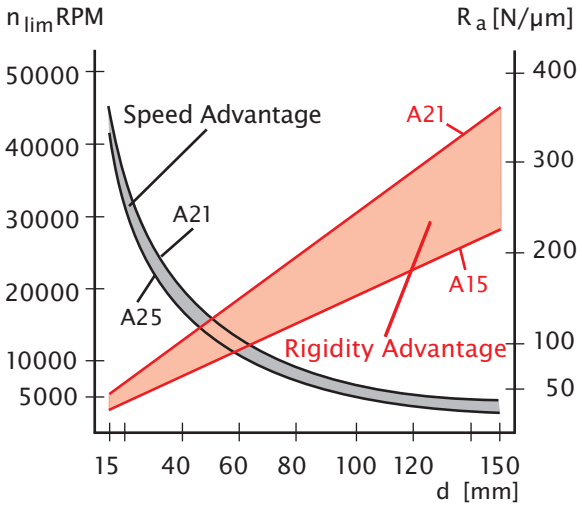
Pre-lubricated bearings; packed with proven high-performance grease; filled with the exact quantity - so bearing is ready for installation → page 50

Notice: the High Speed Spindle Bearings → page 20
These are furnished with a 15° contact angle, respectively, 25° upon application

Optimum 21° Contact Angle

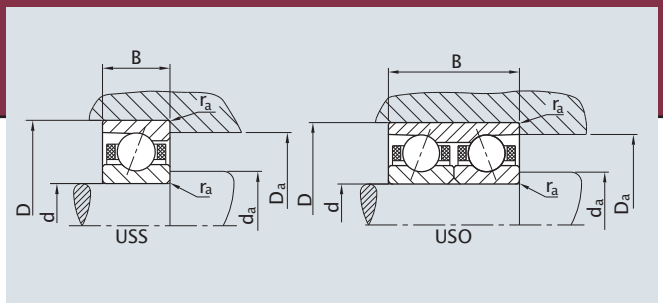
With an intermediate contact angle of α = 21°, these bearings achieve excellent performance advantages over the more common 15° and 25° contact angles:
- compared to 15°, a higher axial rigidity and axial load capacity
- compared to 25°, a higher Speed Limit, i.e., higher RPM.

Axial Rigidity and Speed Limit, i.e., type 719 USS



UKF Spindle Bearings

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



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

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

Dimensions:
USS similar to Single Row Bearing Series 719/70
USO similar to a Pair Single Row Bearings Series 719/70

Nominal Size d	D	B	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a	d_a	D_a	Mass m
	mm										
15	28	7	**719 USS 15**	2600	4600	44000	67000	0,15	17,5	25,5	0,02
	28	14	**719 USO 15**	5200	8300	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	11000	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	8500	37500	59000	0,15	19,5	27,5	0,03
	35	10	**70 USS 17**	4000	7400	36000	55000	0,3	21,0	31,0	0,04
	35	20	**70 USO 17**	8000	13300	34000	53000	0,3	21,0	31,0	0,08
20	37	9	**719 USS 20**	4100	7000	33000	51000	0,15	23,0	34,0	0,04
	37	18	**719 USO 20**	8200	12600	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	18400	28000	44000	0,6	25,0	37,0	0,14
25	42	9	**719 USS 25**	4900	7300	28000	43000	0,15	28,0	39,0	0,04
	42	18	**719 USO 25**	9800	13200	26500	41000	0,15	28,0	39,0	0,08
	47	12	**70 USS 25**	8200	13400	26000	40000	0,6	30,0	42,0	0,08
	47	24	**70 USO 25**	16400	24100	24000	38000	0,6	30,0	42,0	0,16
30	47	9	**719 USS 30**	5700	7800	24000	37500	0,15	33,0	44,0	0,05
	47	18	**719 USO 30**	11400	14100	23000	36000	0,15	33,0	44,0	0,09
	55	13	**70 USS 30**	10000	14700	22000	34000	1,0	36,0	49,0	0,11
	55	26	**70 USO 30**	20000	26500	21500	32000	1,0	36,0	49,0	0,22
35	55	10	**719 USS 35**	9400	12800	21000	32000	0,3	39,5	50,5	0,08
	55	20	**719 USO 35**	18800	23000	19500	30500	0,3	39,5	50,5	0,15
	62	14	**70 USS 35**	13400	18100	19500	29500	1,0	41,5	55,5	0,15
	62	28	**70 USO 35**	26800	32500	18500	28000	1,0	41,5	55,5	0,30
40	62	12	**719 USS 40**	10800	13500	18000	28000	0,3	44,0	58,0	0,11
	62	24	**719 USO 40**	21600	24300	17000	27000	0,3	44,0	58,0	0,22
	68	15	**70 USS 40**	13700	18500	17000	26000	1,0	47,0	61,0	0,18
	68	30	**70 USO 40**	27400	33100	16000	25000	1,0	47,0	61,0	0,36
45	68	12	**719 USS 45**	12800	13600	16500	25000	0,3	49,5	63,5	0,13
	68	24	**719 USO 45**	25600	24500	15500	24000	0,3	49,5	63,5	0,26
	75	16	**70 USS 45**	19300	25800	15500	24000	1,0	51,5	68,5	0,24
	75	32	**70 USO 45**	38600	46400	14500	23000	1,0	51,5	68,5	0,48
50	72	12	**719 USS 50**	13000	14400	15500	24000	0,3	54,0	68,0	0,13
	72	24	**719 USO 50**	26000	25900	14500	23000	0,3	54,0	68,0	0,26
	80	16	**70 USS 50**	22300	27800	14000	22000	1,0	56,5	73,5	0,25
	80	32	**70 USO 50**	44600	49900	13500	21000	1,0	56,5	73,5	0,50
55	80	13	**719 USS 55**	18900	21500	14000	21000	0,3	59,5	75,5	0,18
	80	26	**719 USO 55**	37800	38700	13000	20000	0,3	59,5	75,5	0,36
	90	18	**70 USS 55**	24200	28500	12500	20000	1,0	62,0	83,0	0,38
	90	36	**70 USO 55**	48200	51300	12000	19000	1,0	62,0	83,0	0,76
60	85	13	**719 USS 60**	21400	22900	13000	20000	0,3	64,5	80,5	0,19
	85	26	**719 USO 60**	42800	41200	12000	19000	0,3	64,5	80,5	0,37
	95	18	**70 USS 60**	26800	31600	12000	18500	1,0	67,0	88,0	0,41
	95	36	**70 USO 60**	53700	56900	11000	17500	1,0	67,0	88,0	0,82

UKF Spindle Bearings

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

Favorable Speed Limit Factor f_3 by using Type USO

single row	Ø ⦸	f_3 = 1,0	**double row, like USO**		
DT	ØØ ⦸⦸	= 0,95			
DB	Ø⦸ Ø⦸	= 0,9	**DB**	Ø⦸	= 1,0
TBT	ØØ⦸ Ø⦸	= 0,75	**TBT**	ØØ⦸ **	= 0,9
QBC	ØØ⦸⦸ Ø⦸	= 0,85	**QBC**	ØØ⦸⦸ **	= 0,85
** combined with USS			**2DB**	Ø⦸Ø⦸	= 0,8

Nominal Size d	D	B	UKF Type			Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a	d_a	D_a	Mass m
65	90	13	**719**	**USS**	**65**	22300	23000	12000	18500	0,3	69,5	85,5	0,21
	90	26	**719**	**USO**	**65**	44600	41400	11500	17500	0,3	69,5	85,5	0,41
	100	18	**70**	**USS**	**65**	28600	32500	11000	17500	1,0	72,0	93,0	0,43
	100	36	**70**	**USO**	**65**	57200	58500	10500	16000	1,0	72,0	93,0	0,85
70	100	16	**719**	**USS**	**70**	29000	30400	11000	17000	0,3	75,5	94,5	0,33
	100	32	**719**	**USO**	**70**	58000	54700	10000	16000	0,3	75,5	94,5	0,66
	110	20	**70**	**USS**	**70**	38100	43000	10000	16000	1,0	78,0	102,0	0,60
	110	40	**70**	**USO**	**70**	76200	77400	9500	15000	1,0	78,0	102,0	1,20
75	105	16	**719**	**USS**	**75**	30500	31100	10000	16000	0,3	80,5	99,5	0,35
	105	32	**719**	**USO**	**75**	61000	56000	9500	15000	0,3	80,5	99,5	0,70
	115	20	**70**	**USS**	**75**	40600	44300	9500	15000	1,0	83,0	107,0	0,61
	115	40	**70**	**USO**	**75**	81200	79700	9000	14500	1,0	83,0	107,0	1,35
80	110	16	**719**	**USS**	**80**	32000	31800	9500	15000	0,3	85,5	104,5	0,38
	110	32	**719**	**USO**	**80**	64000	57200	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	97200	8500	13000	1,0	89,0	116,0	1,75
85	120	18	**719**	**USS**	**85**	41800	41000	9000	14000	0,6	92,5	114,5	0,53
	120	36	**719**	**USO**	**85**	83600	73800	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	102200	8000	13000	1,0	94,0	121,0	1,80
90	125	18	**719**	**USS**	**90**	43600	42400	8500	13500	0,6	96,5	118,5	0,58
	125	36	**719**	**USO**	**90**	87200	75600	8000	13000	0,6	96,5	118,5	1,15
	140	24	**70**	**USS**	**90**	69000	69600	8000	12500	1,2	100,0	130,0	1,15
	140	48	**70**	**USO**	**90**	139000	125300	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	93600	7000	11500	0,6	107,0	132,0	1,56
	150	24	**70**	**USS**	**100**	78600	78500	7500	11500	1,2	110,0	140,0	1,30
	150	48	**70**	**USO**	**100**	157200	141300	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	97900	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	171700	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	120000	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	180300	5800	9000	1,5	132,0	168,0	4,30
130	180	24	**719**	**USS**	**130**	94400	83200	6000	9400	0,6	139,0	171,0	1,55
	180	48	**719**	**USO**	**130**	188800	149800	5500	9000	0,6	139,0	171,0	3,10
	200	33	**70**	**USS**	**130**	138000	136300	5600	8600	1,5	144,5	185,5	3,25
	200	66	**70**	**USO**	**130**	276000	244000	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	152500	5000	8000	0,6	148,5	181,5	3,26
	210	33	**70**	**USS**	**140**	146600	139100	5200	8000	1,5	154,5	195,5	3,50
	210	66	**70**	**USO**	**140**	293200	250400	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

Optimal Contact Angle α = 21°

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

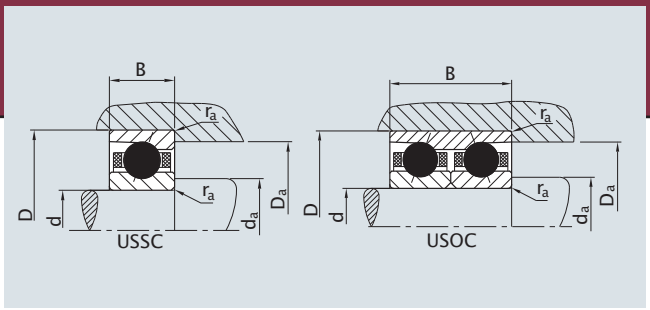
Series 719 USS, 70 USS as Single Row (paired in O- or X-arrangement), 719 USO, 70 USO as Double Row

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


UKF 70 USS 80 A21 0/0 M
<-2/-1>
<-2/-1>
Germany

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, $\alpha = 21°$;
15°...25° upon request.

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

Dimensions:
USSC similar to Single Row Bearing Series 719/70
USOC similar 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				N	N	Grease lubrication	minimum oil lubrication	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**	2860	5810	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	7700	52500	81200	0,3	18,5	28,5	0,05
17	30	7	**719 USSC 17**	1570	3360	56000	86800	0,15	19,5	27,5	0,02
	30	14	**719 USOC 17**	3135	5950	52500	82600	0,15	19,5	27,5	0,03
	35	10	**70 USSC 17**	2200	5180	50400	77000	0,3	21,0	31,0	0,04
	35	20	**70 USOC 17**	4400	9310	47600	74200	0,3	21,0	31,0	0,07
20	37	9	**719 USSC 20**	2255	4900	46200	71400	0,15	23,0	34,0	0,03
	37	18	**719 USOC 20**	4510	8820	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	12880	39200	61600	0,6	25,0	37,0	0,13
25	42	9	**719 USSC 25**	2695	5110	39200	60200	0,15	28,0	39,0	0,04
	42	18	**719 USOC 25**	5390	9240	37100	57400	0,15	28,0	39,0	0,07
	47	12	**70 USSC 25**	4510	9380	36400	56000	0,6	30,0	42,0	0,07
	47	24	**70 USOC 25**	9020	16870	33600	53200	0,6	30,0	42,0	0,14
30	47	9	**719 USSC 30**	3135	5460	33600	52500	0,15	33,0	44,0	0,04
	47	18	**719 USOC 30**	6270	9870	32200	50400	0,15	33,0	44,0	0,08
	55	13	**70 USSC 30**	5500	10290	30800	47600	1,0	36,0	49,0	0,10
	55	26	**70 USOC 30**	11000	18550	30100	44800	1,0	36,0	49,0	0,19
35	55	10	**719 USSC 35**	5170	8960	29400	44800	0,3	39,5	50,5	0,07
	55	20	**719 USOC 35**	10340	16100	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	22750	25900	39200	1,0	41,5	55,5	0,26
40	62	12	**719 USSC 40**	5940	9450	25200	39200	0,3	44,0	58,0	0,10
	62	24	**719 USOC 40**	11880	17010	23800	37800	0,3	44,0	58,0	0,19
	68	15	**70 USSC 40**	7535	12950	23800	36400	1,0	47,0	61,0	0,16
	68	30	**70 USOC 40**	15070	23170	22400	35000	1,0	47,0	61,0	0,32
45	68	12	**719 USSC 45**	7040	9520	23100	35000	0,3	49,5	63,5	0,11
	68	24	**719 USOC 45**	14080	17150	21700	33600	0,3	49,5	63,5	0,23
	75	16	**70 USSC 45**	10615	18060	21700	33600	1,0	51,5	68,5	0,21
	75	32	**70 USOC 45**	21230	32480	20300	32200	1,0	51,5	68,5	0,42
50	72	12	**719 USSC 50**	7150	10080	21700	33600	0,3	54,0	68,0	0,11
	72	24	**719 USOC 50**	14300	18130	20300	32200	0,3	54,0	68,0	0,23
	80	16	**70 USSC 50**	12265	19460	19600	30800	1,0	56,5	73,5	0,22
	80	32	**70 USOC 50**	24530	34930	18900	29400	1,0	56,5	73,5	0,45
55	80	13	**719 USSC 55**	10395	15050	19600	29400	0,3	59,5	75,5	0,16
	80	26	**719 USOC 55**	20790	27090	18200	28000	0,3	59,5	75,5	0,32
	90	18	**70 USSC 55**	13310	19950	17500	28000	1,0	62,0	83,0	0,33
	90	36	**70 USOC 55**	26510	35910	16800	26600	1,0	62,0	83,0	0,67
60	85	13	**719 USSC 60**	11770	16030	18200	28000	0,3	64,5	80,5	0,16
	85	26	**719 USOC 60**	23540	28840	16800	26600	0,3	64,5	80,5	0,31
	95	18	**70 USSC 60**	14740	22120	16800	25900	1,0	67,0	88,0	0,35
	95	36	**70 USOC 60**	29535	39830	15400	24500	1,0	67,0	88,0	0,70

Favorable Speed Limit Factor f_3 by using Type USO

single row	Ø ⦸	f_3 = **1,0**	**double row, Type USO**		
DT	ØØ ⦸⦸	= **0,95**			
DB	Ø⦸ Ø⦸	= **0,9**	**DB**	Ø⦸	= **1,0**
TBT	ØØ⦸ Ø⦸	= **0,75**	**TBT**	ØØ⦸ **	= **0,9**
QBC	ØØ⦸⦸ Ø⦸	= **0,85**	**QBC**	ØØ⦸⦸ **	= **0,85**
** combined with USS			**2DB**	Ø⦸Ø⦸	= **0,8**

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 USSC 65**	12265	16100	16800	25900	0,3	69,5	85,5	0,17
	90	26	**719 USOC 65**	24530	28980	16100	24500	0,3	69,5	85,5	0,35
	100	18	**70 USSC 65**	15730	22750	15400	24500	1,0	72,0	93,0	0,37
	100	36	**70 USOC 65**	31460	40950	14700	22400	1,0	72,0	93,0	0,72
70	100	16	**719 USSC 70**	15950	21280	15400	23800	0,3	75,5	94,5	0,28
	100	32	**719 USOC 70**	31900	38290	14000	22400	0,3	75,5	94,5	0,56
	110	20	**70 USSC 70**	20955	30100	14000	22400	1,0	78,0	102,0	0,51
	110	40	**70 USOC 70**	41910	54180	13300	21000	1,0	78,0	102,0	1,02
75	105	16	**719 USSC 75**	16775	21770	14000	22400	0,3	80,5	99,5	0,30
	105	32	**719 USOC 75**	33550	39200	13300	21000	0,3	80,5	99,5	0,60
	115	20	**70 USSC 75**	22330	31010	13300	21000	1,0	83,0	107,0	0,52
	115	40	**70 USOC 75**	44660	55790	12600	20300	1,0	83,0	107,0	1,15
80	110	16	**719 USSC 80**	17600	22260	13300	21000	0,3	85,5	104,5	0,32
	110	32	**719 USOC 80**	35200	40040	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	68040	11900	18200	1,0	89,0	116,0	1,49
85	120	18	**719 USSC 85**	22990	28700	12600	19600	0,6	92,5	114,5	0,45
	120	36	**719 USOC 85**	45980	51660	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	71540	11200	18200	1,0	94,0	121,0	1,53
90	125	18	**719 USSC 90**	23980	29680	11900	18900	0,6	96,5	118,5	0,49
	125	36	**719 USOC 90**	47960	52920	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	87710	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	65520	9800	16100	0,6	107,0	132,0	1,33
	150	24	**70 USSC 100**	43230	55020	10500	16100	1,2	110,0	140,0	1,11
	150	48	**70 USOC 100**	86460	98910	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	68530	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	120190	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	84000	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	126210	8100	12600	1,5	132,0	168,0	3,66
130	180	24	**719 USSC 130**	51920	58240	8400	13100	0,6	139,0	171,0	1,32
	180	48	**719 USOC 130**	103840	104860	7700	12600	0,6	139,0	171,0	2,64
	200	33	**70 USSC 130**	75900	95410	7800	12000	1,5	144,5	185,5	2,76
	200	66	**70 USOC 130**	151800	170800	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**	110000	106750	7000	11200	0,6	148,5	181,5	2,77
	210	33	**70 USSC 140**	80630	97370	7200	11200	1,5	154,5	195,5	2,98
	210	66	**70 USOC 140**	161260	175280	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**	146300	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**	195800	198800	6100	10000	1,5	165,5	209,5	7,23

Optimal Contact Angle α = 21°

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

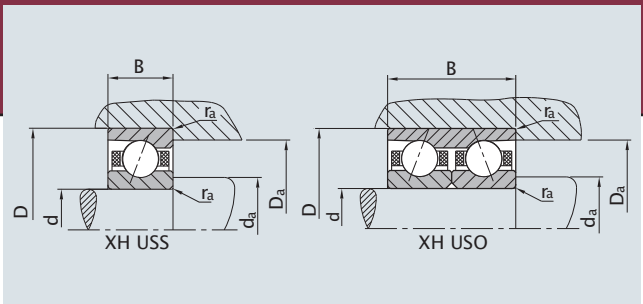
Series 719/70 USSC, XH 719/70 USSC Single Row (paired in O- or X), 719/70 USOC, XH 719/70 as Double Row

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


UKF XH 70 USS 80 A21 0/0 M
< -3 / -1 >
Germany

UKF Spindle Bearings of CRONIDEX® Steel with Steel Balls (XH-Bearings)

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



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

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

Dimensions:
XH USS similar Single Row Bearings Series 719/70
XH USO similar to a pair Single Row Bearings 719/70

Nominal Size d	D	B	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	Speed Limit n_{lim}RPM minimum oil lubrication	Seat Dimensions r_a	d_a	D_a	Mass m kg
	mm								mm		
15	28	7	**XH 719 USS 15**	3100	9700	53000	80000	0,15	17,5	25,5	0,02
	28	14	**XH 719 USO 15**	6000	17400	49000	76500	0,15	17,5	25,5	0,03
	32	9	**XH 70 USS 15**	4200	13400	47500	73000	0,3	18,5	28,5	0,03
	32	18	**XH 70 USO 15**	8300	23100	45000	69000	0,3	18,5	28,5	0,06
17	30	7	**XH 719 USS 17**	3300	10100	48000	74000	0,15	19,5	27,5	0,02
	30	14	**XH 719 USO 17**	6600	17900	45500	70000	0,15	19,5	27,5	0,03
	35	10	**XH 70 USS 17**	4600	15500	43500	65000	0,3	21,0	31,0	0,04
	35	20	**XH 70 USO 17**	9200	27900	41000	62500	0,3	21,0	31,0	0,08
20	37	9	**XH 719 USS 20**	4700	14700	40000	60000	0,15	23,0	34,0	0,04
	37	18	**XH 719 USO 20**	9400	26500	37500	57000	0,15	23,0	34,0	0,07
	42	12	**XH 70 USS 20**	7400	22700	36000	54500	0,6	25,0	37,0	0,07
	42	24	**XH 70 USO 20**	14800	38600	34000	52000	0,6	25,0	37,0	0,14
25	42	9	**XH 719 USS 25**	5700	15300	34000	51000	0,15	28,0	39,0	0,04
	42	18	**XH 719 USO 25**	11300	27700	32000	48000	0,15	28,0	39,0	0,08
	47	12	**XH 70 USS 25**	9500	28100	31200	47000	0,6	30,0	42,0	0,08
	47	24	**XH 70 USO 25**	18900	50600	29000	45000	0,6	30,0	42,0	0,16
30	47	9	**XH 719 USS 30**	6600	16400	28800	44000	0,15	33,0	44,0	0,05
	47	18	**XH 719 USO 30**	13200	29600	27600	42500	0,15	33,0	44,0	0,09
	55	13	**XH 70 USS 30**	11600	30900	26500	40000	1,0	36,0	49,0	0,11
	55	26	**XH 70 USO 30**	23100	55700	26000	37500	1,0	36,0	49,0	0,22
35	55	10	**XH 719 USS 35**	10900	26900	25500	37000	0,3	39,5	50,5	0,08
	55	20	**XH 719 USO 35**	21700	48300	23500	35500	0,3	39,5	50,5	0,15
	62	14	**XH 70 USS 35**	15500	38600	23400	35000	1,0	41,5	55,5	0,15
	62	28	**XH 70 USO 35**	31000	68300	22500	33000	1,0	41,5	55,5	0,30
40	62	12	**XH 719 USS 40**	12500	28400	22000	32500	0,3	44,0	58,0	0,11
	62	24	**XH 719 USO 40**	24900	51000	20500	31500	0,3	44,0	58,0	0,22
	68	15	**XH 70 USS 40**	15800	38900	20400	30500	1,0	47,0	61,0	0,18
	68	30	**XH 70 USO 40**	31600	69500	19200	30000	1,0	47,0	61,0	0,36
45	68	12	**XH 719 USS 45**	14800	28600	20000	29500	0,3	49,5	63,5	0,13
	68	24	**XH 719 USO 45**	29600	51500	18600	28000	0,3	49,5	63,5	0,26
	75	16	**XH 70 USS 45**	22300	54200	18600	28000	1,0	51,5	68,5	0,24
	75	32	**XH 70 USO 45**	44600	97400	17500	27000	1,0	51,5	68,5	0,48
50	72	12	**XH 719 USS 50**	15000	30200	18600	28000	0,3	54,0	68,0	0,13
	72	24	**XH 719 USO 50**	30000	54400	17500	27000	0,3	54,0	68,0	0,26
	80	16	**XH 70 USS 50**	25800	58400	17000	26000	1,0	56,5	73,5	0,25
	80	32	**XH 70 USO 50**	51500	104800	16200	24500	1,0	56,5	73,5	0,50
55	80	13	**XH 719 USS 55**	21800	45200	17000	25000	0,3	59,5	75,5	0,18
	80	26	**XH 719 USO 55**	43600	81300	16000	24000	0,3	59,5	75,5	0,36
	90	18	**XH 70 USS 55**	28000	59900	15000	24000	1,0	62,0	83,0	0,38
	90	36	**XH 70 USO 55**	55900	107700	14500	22500	1,0	62,0	83,0	0,76
60	85	13	**XH 719 USS 60**	24700	48100	16000	24000	0,3	64,5	80,5	0,19
	85	26	**XH 719 USO 60**	49400	86500	14500	22000	0,3	64,5	80,5	0,37
	95	18	**XH 70 USS 60**	31000	66400	14400	22000	1,0	67,0	88,0	0,41
	95	36	**XH 70 USO 60**	62000	119500	13500	21000	1,0	67,0	88,0	0,42

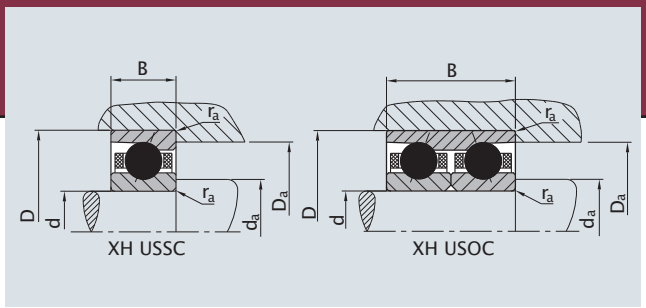
Favorable Speed Limit Factor f_3 by using Type USO

single row	Ø ⦰	f_3 = 1,0	**double row, Type USO**		
DT	ØØ ⦰⦰	= 0,95			
DB	Ø⦰ Ø⦰	= 0,9	**DB**	Ø⦰	= 1,0
TBT	ØØ⦰ Ø⦰	= 0,75	**TBT**	ØØ⦰ **	= 0,9
QBC	ØØ⦰⦰ Ø⦰	= 0,85	**QBC**	ØØ⦰⦰ **	= 0,85
** combined with USS			**2DB**	Ø⦰Ø⦰	= 0,8

Nominal Size d	D	B	UKF Type			Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a mm	d_a mm	D_a mm	Mass m kg
65	90	13	**XH 719**	**USS**	**65**	25800	48300	14500	22200	0,3	69,5	85,5	0,21
	90	26	**XH 719**	**USO**	**65**	51500	86900	14000	21000	0,3	69,5	85,5	0,41
	100	18	**XH 70**	**USS**	**65**	33000	68300	13500	20500	1,0	72,0	93,0	0,43
	100	36	**XH 70**	**USO**	**65**	66000	122900	13000	18500	1,0	72,0	93,0	0,85
70	100	16	**XH 719**	**USS**	**70**	33500	63800	13500	20000	0,3	75,5	94,5	0,33
	100	32	**XH 719**	**USO**	**70**	67000	114900	12000	19000	0,3	75,5	94,5	0,66
	110	20	**XH 70**	**USS**	**70**	44000	90300	12000	19000	1,0	78,0	102,0	0,60
	110	40	**XH 70**	**USO**	**70**	88000	162500	11500	18000	1,0	78,0	102,0	1,20
75	105	16	**XH 719**	**USS**	**75**	35200	65300	12000	18500	0,3	80,5	99,5	0,35
	105	32	**XH 719**	**USO**	**75**	70400	117600	11500	17500	0,3	80,5	99,5	0,70
	115	20	**XH 70**	**USS**	**75**	46900	93000	11500	17500	1,0	83,0	107,0	0,61
	115	40	**XH 70**	**USO**	**75**	93800	167400	11000	17000	1,0	83,0	107,0	1,35
80	110	16	**XH 719**	**USS**	**80**	37000	66800	11500	18000	0,3	85,5	104,5	0,38
	110	32	**XH 719**	**USO**	**80**	73900	120100	11000	17000	0,3	85,5	104,5	0,75
	125	22	**XH 70**	**USS**	**80**	58300	119900	10500	16000	1,0	89,0	116,0	0,87
	125	44	**XH 70**	**USO**	**80**	116600	204100	10000	15000	1,0	89,0	116,0	1,75
85	120	18	**XH 719**	**USS**	**85**	48300	86100	11000	16500	0,6	92,5	114,5	0,53
	120	36	**XH 719**	**USO**	**85**	96600	155000	10500	16000	0,6	92,5	114,5	1,05
	130	22	**XH 70**	**USS**	**85**	66400	127100	10500	15500	1,0	94,0	121,0	0,90
	130	44	**XH 70**	**USO**	**85**	132800	214600	10000	14500	1,0	94,0	121,0	1,80
90	125	18	**XH 719**	**USS**	**90**	50400	89000	10500	16000	0,6	96,5	118,5	0,58
	125	36	**XH 719**	**USO**	**90**	100700	158800	10000	15000	0,6	96,5	118,5	1,15
	140	24	**XH 70**	**USS**	**90**	79700	155400	9500	14000	1,2	100,0	130,0	1,15
	140	48	**XH 70**	**USO**	**90**	159400	263100	9000	13000	1,2	100,0	130,0	2,30
100	140	20	**XH 719**	**USS**	**100**	68100	116600	9000	13500	0,6	107,0	132,0	0,78
	140	40	**XH 719**	**USO**	**100**	136200	196600	8500	13000	0,6	107,0	132,0	1,56
	150	24	**XH 70**	**USS**	**100**	90800	165100	8500	12500	1,2	110,0	140,0	1,30
	150	48	**XH 70**	**USO**	**100**	181600	296700	8000	12000	1,2	110,0	140,0	2,60
110	150	20	**XH 719**	**USS**	**110**	71600	115500	8000	12000	0,6	117,0	143,0	0,85
	150	40	**XH 719**	**USO**	**110**	143200	205600	7500	11500	0,6	117,0	143,0	1,70
	170	28	**XH 70**	**USS**	**110**	115500	216300	7500	11000	1,2	122,0	158,0	2,00
	170	56	**XH 70**	**USO**	**110**	231000	360600	7000	10500	1,2	122,0	158,0	4,00
120	165	22	**XH 719**	**USS**	**120**	90700	144700	7500	11500	0,6	128,0	151,0	1,15
	165	44	**XH 719**	**USO**	**120**	181300	252000	7000	11000	0,6	128,0	151,0	2,30
	180	28	**XH 70**	**USS**	**120**	123600	220500	7000	11000	1,5	132,0	168,0	2,15
	180	56	**XH 70**	**USO**	**120**	247200	378600	6500	10500	1,5	132,0	168,0	4,30
130	180	24	**XH 719**	**USS**	**130**	109000	174700	7000	11000	0,6	139,0	171,0	1,55
	180	48	**XH 719**	**USO**	**130**	218000	314600	6500	10500	0,6	139,0	171,0	3,10
	200	33	**XH 70**	**USS**	**130**	159400	286200	6500	10000	1,5	144,5	185,5	3,25
	200	66	**XH 70**	**USO**	**130**	318800	512400	6000	9500	1,5	144,5	185,5	6,55
140	190	24	**XH 719**	**USS**	**140**	115500	179600	6500	10000	0,6	148,5	181,5	1,63
	190	48	**XH 719**	**USO**	**140**	231000	320300	6000	9500	0,6	148,5	181,5	3,26
	210	33	**XH 70**	**USS**	**140**	169300	292100	6000	9500	1,5	154,5	195,5	3,50
	210	66	**XH 70**	**USO**	**140**	338600	525800	5700	9000	1,5	154,5	195,5	7,00
150	210	28	**XH 719**	**USS**	**150**	153600	241500	6000	9500	1,0	161,0	199,0	2,55
	210	56	**XH 719**	**USO**	**150**	307200	392700	5600	9000	1,0	161,0	199,0	5,10
	225	35	**XH 70**	**USS**	**150**	205600	367500	5800	9000	1,5	165,5	209,5	4,25
	225	70	**XH 70**	**USO**	**150**	411200	596400	5300	8500	1,5	165,5	209,5	8,50

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, $\alpha = 21°$;
15°...25° upon request.

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

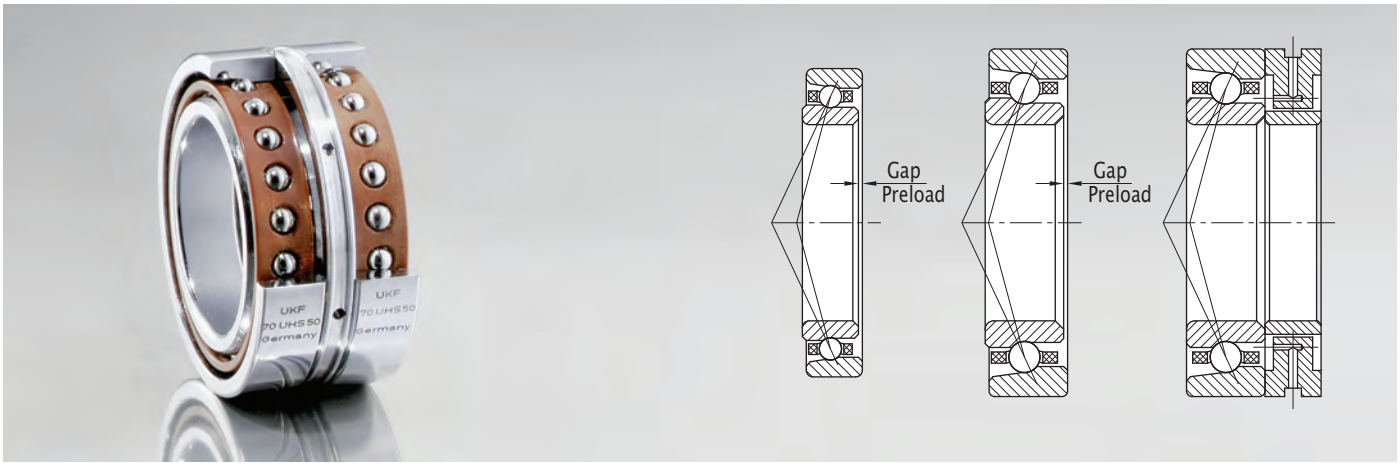
Dimensions:
XH USSC similar Single Row Bearings Series 719/70
XH USOC similar to a pair Single Row Bearings 719/70

Nominal Size d	D	B	UKF Type	Ratings C_0	C	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a	d_a	D_a	Mass m
	mm			N	N			mm			kg
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**	3640	11620	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	15400	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**	3920	11900	60000	94400	0,15	19,5	27,5	0,03
	35	10	**XH 70 USSC 17**	2800	10360	57600	88000	0,3	21,0	31,0	0,04
	35	20	**XH 70 USOC 17**	5600	18620	54400	84800	0,3	21,0	31,0	0,07
20	37	9	**XH 719 USSC 20**	2870	9800	52800	81600	0,15	23,0	34,0	0,03
	37	18	**XH 719 USOC 20**	5740	17640	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	25760	44800	70400	0,6	25,0	37,0	0,13
25	42	9	**XH 719 USSC 25**	3430	10220	44800	68800	0,15	28,0	39,0	0,04
	42	18	**XH 719 USOC 25**	6860	18480	42400	65600	0,15	28,0	39,0	0,07
	47	12	**XH 70 USSC 25**	5740	18760	41600	64000	0,6	30,0	42,0	0,07
	47	24	**XH 70 USOC 25**	11480	33740	38400	60800	0,6	30,0	42,0	0,14
30	47	9	**XH 719 USSC 30**	3990	10920	38400	60000	0,15	33,0	44,0	0,04
	47	18	**XH 719 USOC 30**	7980	19740	36800	57600	0,15	33,0	44,0	0,08
	55	13	**XH 70 USSC 30**	7000	20580	35200	54400	1,0	36,0	49,0	0,10
	55	26	**XH 70 USOC 30**	14000	37100	34400	51200	1,0	36,0	49,0	0,19
35	55	10	**XH 719 USSC 35**	6580	17920	33600	51200	0,3	39,5	50,5	0,07
	55	20	**XH 719 USOC 35**	13160	32200	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	45500	29600	44800	1,0	41,5	55,5	0,26
40	62	12	**XH 719 USSC 40**	7560	18900	28800	44800	0,3	44,0	58,0	0,10
	62	24	**XH 719 USOC 40**	15120	34020	27200	43200	0,3	44,0	58,0	0,19
	68	15	**XH 70 USSC 40**	9590	25900	27200	41600	1,0	47,0	61,0	0,16
	68	30	**XH 70 USOC 40**	19180	46340	25600	40000	1,0	47,0	61,0	0,32
45	68	12	**XH 719 USSC 45**	8960	19040	26400	40000	0,3	49,5	63,5	0,11
	68	24	**XH 719 USOC 45**	17920	34300	24800	38400	0,3	49,5	63,5	0,23
	75	16	**XH 70 USSC 45**	13510	36120	24800	38400	1,0	51,5	68,5	0,21
	75	32	**XH 70 USOC 45**	27020	64960	23200	36800	1,0	51,5	68,5	0,42
50	72	12	**XH 719 USSC 50**	9100	20160	24800	38400	0,3	54,0	68,0	0,11
	72	24	**XH 719 USOC 50**	18200	36260	23200	36800	0,3	54,0	68,0	0,23
	80	16	**XH 70 USSC 50**	15610	38920	22400	35200	1,0	56,5	73,5	0,22
	80	32	**XH 70 USOC 50**	31220	69860	21600	33600	1,0	56,5	73,5	0,45
55	80	13	**XH 719 USSC 55**	13230	30100	22400	33600	0,3	59,5	75,5	0,16
	80	26	**XH 719 USOC 55**	26460	54180	20800	32000	0,3	59,5	75,5	0,32
	90	18	**XH 70 USSC 55**	16940	39900	20000	32000	1,0	62,0	83,0	0,33
	90	36	**XH 70 USOC 55**	33880	71820	19200	30400	1,0	62,0	83,0	0,67
60	85	13	**XH 719 USSC 60**	14980	32060	20800	32000	0,3	64,5	80,5	0,16
	85	26	**XH 719 USOC 60**	29960	57680	19200	30400	0,3	64,5	80,5	0,31
	95	18	**XH 70 USSC 60**	18760	44240	19200	29600	1,0	67,0	88,0	0,35
	95	36	**XH 70 USOC 60**	37590	79660	17600	28000	1,0	67,0	88,0	0,70

Favorable Speed Limit Factor f_3 by using Type USO

single row	Ø	⦰	**f_3 = 1,0**	**double row, Type USO**	
DT	ØØ	⦰⦰	**= 0,95**		
DB	ØØ	Ø⦰	**= 0,9**	**DB**	Ø⦰ **= 1,0**
TBT	ØØ⦰	Ø⦰	**= 0,75**	**TBT**	ØØ⦰ ** **= 0,9**
QBC	ØØ⦰⦰	Ø⦰	**= 0,85**	**QBC**	ØØ⦰⦰ ** **= 0,85**
** combined with USS				**2DB**	Ø⦰Ø⦰ **= 0,8**

Nominal Size d	D	B	UKF Type	C_0	C	n_{lim}RPM Grease lubrication	n_{lim}RPM minimum oil lubrication	r_a	d_a	D_a	Mass m
mm				N	N			mm			kg
65	90	13	**XH 719 USSC 65**	15610	32200	19200	29600	0,3	69,5	85,5	0,17
	90	26	**XH 719 USOC 65**	31220	57960	18400	28000	0,3	69,5	85,5	0,35
	100	18	**XH 70 USSC 65**	20020	45500	17600	28000	1,0	72,0	93,0	0,37
	100	36	**XH 70 USOC 65**	40040	81900	16800	25600	1,0	72,0	93,0	0,72
70	100	16	**XH 719 USSC 70**	20300	42560	17600	27200	0,3	75,5	94,5	0,28
	100	32	**XH 719 USOC 70**	40600	76580	16000	25600	0,3	75,5	94,5	0,56
	110	20	**XH 70 USSC 70**	26670	60200	16000	25600	1,0	78,0	102,0	0,51
	110	40	**XH 70 USOC 70**	53340	108360	15200	24000	1,0	78,0	102,0	1,02
75	105	16	**XH 719 USSC 75**	21350	43540	16000	25600	0,3	80,5	99,5	0,30
	105	32	**XH 719 USOC 75**	42700	78400	15200	24000	0,3	80,5	99,5	0,60
	115	20	**XH 70 USSC 75**	28420	62020	15200	24000	1,0	83,0	107,0	0,52
	115	40	**XH 70 USOC 75**	56840	111580	14400	23200	1,0	83,0	107,0	1,15
80	110	16	**XH 719 USSC 80**	22400	44520	15200	24000	0,3	85,5	104,5	0,32
	110	32	**XH 719 USOC 80**	44800	80080	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	136080	13600	20800	1,0	89,0	116,0	1,49
85	120	18	**XH 719 USSC 85**	29260	57400	14400	22400	0,6	92,5	114,5	0,45
	120	36	**XH 719 USOC 85**	58520	103320	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	143080	12800	20800	1,0	94,0	121,0	1,53
90	125	18	**XH 719 USSC 90**	30520	59360	13600	21600	0,6	96,5	118,5	0,49
	125	36	**XH 719 USOC 90**	61040	105840	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**	96600	175420	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**	82600	131040	11200	18400	0,6	107,0	132,0	1,33
	150	24	**XH 70 USSC 100**	55020	110040	12000	18400	1,2	110,0	140,0	1,11
	150	48	**XH 70 USOC 100**	110040	197820	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	137060	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	240380	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	168000	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**	149800	252420	9200	14400	1,5	132,0	168,0	3,66
130	180	24	**XH 719 USSC 130**	66080	116480	9600	15000	0,6	139,0	171,0	1,32
	180	48	**XH 719 USOC 130**	132160	209720	8800	14400	0,6	139,0	171,0	2,64
	200	33	**XH 70 USSC 130**	96600	190820	8900	13700	1,5	144,5	185,5	2,76
	200	66	**XH 70 USOC 130**	193200	341600	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**	140000	213500	8000	12800	0,6	148,5	181,5	2,77
	210	33	**XH 70 USSC 140**	102620	194740	8300	12800	1,5	154,5	195,5	2,98
	210	66	**XH 70 USOC 140**	205240	350560	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**	186200	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**	249200	397600	7000	11500	1,5	165,5	209,5	7,23



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.

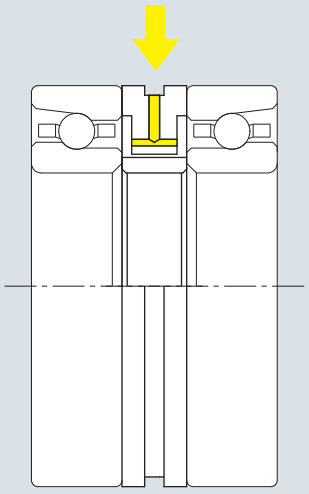
Distance rings, which are used as design and assembly elements to increase axial offset are also helpful in supplying lubricants to the bearings. In the case of grease lubrication, this can also serve as a reservoir for additional lubricant.

Options:

Lubrication feed, through the outer ring, directly into the raceway.→ S. 28

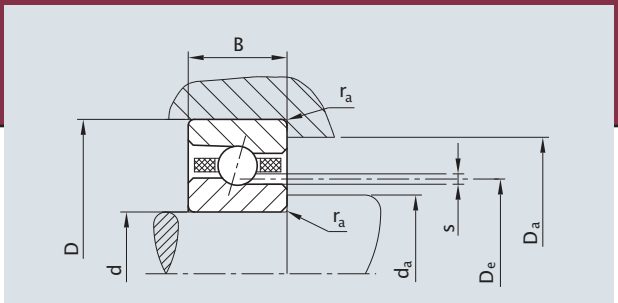
Bearings with integral shields → S. 28

Pre-lubricated bearings; packed with proven high-performance grease; filled with the exact quantity - so bearing is ready for installation → S. 50



Distance Ring implementing lubrication oil → S. 57

Seat Dimensions for UKF High Speed Spindle Bearings

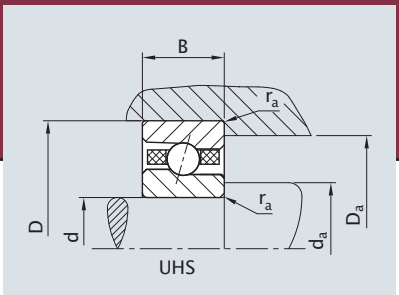


Series 719/70 UHS and 719/70 UHC, also in accordance with Dimensional Series 19, 10

Dimensions and weights

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

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 mm	B mm	UKF Type	Ratings C_0 N	Ratings C N	Speed Limit n_{lim}RPM Grease lubrication	Speed Limit n_{lim}RPM minimum oil lubrication	axial Preload L F_v N	Rigidity R_a	Rigidity R_r N/µm
20	37	9	**719 UHS 20 A15**	3300	5160	59010	88070	40	21	145
	37	9	**719 UHS 20 A25**	3150	4890	49840	74390	65	56	128
	42	12	**70 UHS 20 A15**	5180	6892	53170	79350	50	24	160
	42	12	**70 UHS 20 A25**	4920	6540	44960	67100	80	64	141
25	42	9	**719 UHS 25 A15**	3900	5490	50200	74930	50	26	167
	42	9	**719 UHS 25 A25**	3710	5180	42400	63280	80	69	147
	47	12	**70 UHS 25 A15**	5910	7430	45780	68330	60	28	185
	47	12	**70 UHS 25 A25**	5610	7040	38710	57780	95	74	163
30	47	9	**719 UHS 30 A15**	4490	5780	43680	65190	60	31	200
	47	9	**719 UHS 30 A25**	4230	5450	36890	55060	95	82	176
	55	13	**70 UHS 30 A15**	7780	8450	38780	57880	70	33	215
	55	13	**70 UHS 30 A25**	7850	9670	32790	48940	110	87	189
35	55	10	**719 UHS 35 A15**	6230	6070	37370	55780	70	35	224
	55	10	**719 UHS 35 A25**	5910	5830	31560	47110	110	93	197
	62	14	**70 UHS 35 A15**	8950	10820	33980	50720	80	38	252
	62	14	**70 UHS 35 A25**	9460	10210	28740	42890	130	101	222
40	62	12	**719 UHS 40 A15**	8500	8700	32980	49220	80	38	256
	62	12	**719 UHS 40 A25**	8070	8200	27850	41570	130	101	225
	68	15	**70 UHS 40 A15**	11010	10980	30530	45560	90	40	262
	68	15	**70 UHS 40 A25**	10450	10350	25810	38520	145	106	231
45	68	12	**719 UHS 45 A15**	9310	9010	29760	44420	90	41	281
	68	12	**719 UHS 45 A25**	8840	8490	25140	37520	145	109	247
	75	16	**70 UHS 45 A15**	15390	14510	27470	41000	120	47	313
	75	16	**70 UHS 45 A25**	14620	13700	23230	34670	195	125	275
50	72	12	**719 UHS 50 A15**	9720	9350	27570	41150	100	44	296
	72	12	**719 UHS 50 A25**	9230	8830	23280	34750	165	117	260
	80	16	**70 UHS 50 A15**	17820	14750	25360	37850	130	50	325
	80	16	**70 UHS 50 A25**	16920	13950	21440	32000	210	133	286
55	80	13	**719 UHS 55 A15**	17410	12210	24920	37190	130	51	335
	80	13	**719 UHS 55 A25**	16530	11480	21050	31410	210	135	295
	90	18	**70 UHS 55 A15**	19600	18240	22730	33930	170	56	379
	90	18	**70 UHS 55 A25**	18620	17230	19220	28690	275	148	333
60	85	13	**719 UHS 60 A15**	17010	12320	23200	34620	140	55	363
	85	13	**719 UHS 60 A25**	16150	11570	19590	29240	230	146	319
	95	18	**70 UHS 60 A15**	21700	18580	21270	31740	180	60	394
	95	18	**70 UHS 60 A25**	20610	17440	17980	26840	295	159	347
65	90	13	**719 UHS 65 A15**	17820	12730	21700	32390	150	59	388
	90	13	**719 UHS 65 A25**	16920	11990	18320	27350	245	156	341
	100	18	**70 UHS 65 A15**	21850	18750	19980	29820	190	64	421
	100	18	**70 UHS 65 A25**	20750	17690	16890	25210	310	160	370
70	100	16	**719 UHS 70 A15**	23490	16380	19790	29530	170	64	424
	100	16	**719 UHS 70 A25**	22310	15430	16710	24940	275	160	373
	110	20	**70 UHS 70 A15**	30610	26980	18310	27330	230	71	472
	110	20	**70 UHS 70 A25**	29070	25470	15480	23110	375	188	415

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	Ø	⦸	**f_3 = 1,0**
DT	ØØ	⦸⦸	**= 0,95**
DB	Ø⦸	Ø⦸	**= 0,9**
TBT	ØØ⦸	Ø⦸	**= 0,75**
QBC	ØØ⦸⦸	Ø⦸	**= 0,85**

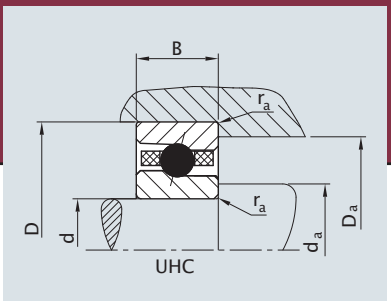
Single Row, with fibre cage,
preloaded,
Contact Angle α: A15 = 15°, A25 = 25°

Dimensions of Series 719/70

Nominal Size d	D	B	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	axial Preload L F_v N	Rigidity axial R_a	N/µm radial R_r
	mm									
75	105	16	**719 UHS 75 A15**	24700	16530	18690	27890	180	67	448
	105	16	**719 UHS 75 A25**	23460	15560	15790	23560	295	178	394
	115	20	**70 UHS 75 A15**	32400	27470	17350	25890	240	74	488
	115	20	**70 UHS 75 A25**	30780	25800	14670	21890	390	196	429
80	110	16	**719 UHS 80 A15**	25920	16720	17700	26420	190	72	471
	110	16	**719 UHS 80 A25**	24620	15730	14950	22320	310	191	414
	125	22	**70 UHS 80 A15**	40900	32210	16080	24000	290	82	545
	125	22	**70 UHS 80 A25**	38850	30240	13590	20290	475	217	480
85	120	18	**719 UHS 85 A15**	33610	24700	16410	24490	220	77	511
	120	18	**719 UHS 85 A25**	31920	23240	13860	20680	360	204	450
	130	22	**70 UHS 85 A15**	46570	32710	15330	22880	300	85	564
	130	22	**70 UHS 85 A25**	44240	30700	12960	19350	490	225	496
90	125	18	**719 UHS 90 A15**	35230	25000	15640	23350	260	83	554
	125	18	**719 UHS 90 A25**	33460	23530	13210	19720	425	220	488
	140	24	**70 UHS 90 A15**	55890	37620	14330	21390	360	94	633
	140	24	**70 UHS 90 A25**	53090	36570	12120	18090	585	249	557
100	140	20	**719 UHS 100 A15**	47790	30250	14020	20920	310	91	610
	140	20	**719 UHS 100 A25**	45400	28470	11840	17670	505	241	537
	150	24	**70 UHS 100 A15**	63580	39260	13190	19680	380	100	664
	150	24	**70 UHS 100 A25**	60400	36940	11150	16640	620	265	684
110	150	20	**719 UHS 110 A15**	50220	31000	12940	19310	330	100	657
	150	20	**719 UHS 110 A25**	47700	29180	10930	16310	535	265	578
	170	28	**70 UHS 110 A15**	81000	56940	11770	17570	500	113	741
	170	28	**70 UHS 110 A25**	76950	53450	9960	14860	815	299	652
120	165	22	**719 UHS 120 A15**	63580	37040	11800	17610	390	109	729
	165	22	**719 UHS 120 A25**	60400	34860	9970	14880	635	289	642
	180	28	**70 UHS 120 A15**	86670	58830	10990	16400	510	120	785
	180	28	**70 UHS 120 A25**	82330	55310	9290	13870	830	318	691
130	180	24	**719 UHS 130 A15**	74920	47570	10850	16190	470	119	784
	180	24	**719 UHS 130 A25**	71170	44780	9170	13680	765	315	690
	200	33	**70 UHS 130 A15**	110640	79630	9990	14910	650	133	876
	200	33	**70 UHS 130 A25**	105100	74890	8450	12610	1060	352	771
140	190	24	**719 UHS 140 A15**	81000	48880	10190	15210	500	124	815
	190	24	**719 UHS 140 A25**	76950	46000	8610	12850	815	329	717
	210	33	**70 UHS 140 A15**	118260	80300	9420	14060	660	136	903
	210	33	**70 UHS 140 A25**	112340	75650	7970	11890	1070	360	795
150	210	28	**719 UHS 150 A15**	107730	62910	9340	13940	620	140	929
	210	28	**719 UHS 150 A25**	102340	59210	7890	11780	1010	371	818
	225	35	**70 UHS 150 A15**	178000	96880	8790	13120	770	146	970
	225	35	**70 UHS 150 A25**	169100	89890	7430	11090	1250	387	854

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 d	D	B	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	axial Preload L F_v N	Rigidity axial R_a	N/µm radial R_r
	mm									
20	37	9	**719 UHC 20 A15**	1820	3610	70810	105680	40	24	167
	37	9	**719 UHC 20 A25**	1730	3420	59810	89270	65	64	147
	42	12	**70 UHC 20 A15**	2850	4820	63800	95220	50	28	184
	42	12	**70 UHC 20 A25**	2710	4580	53950	80520	80	74	162
25	42	9	**719 UHC 25 A15**	2150	3840	60240	89920	50	30	192
	42	9	**719 UHC 25 A25**	2040	3630	50880	75940	80	79	169
	47	12	**70 UHC 25 A15**	3250	5200	54940	82000	60	32	213
	47	12	**70 UHC 25 A25**	3090	4930	46450	69340	95	85	187
30	47	9	**719 UHC 30 A15**	2470	4050	52420	78230	60	36	230
	47	9	**719 UHC 30 A25**	2330	3820	44270	66070	95	94	202
	55	13	**70 UHC 30 A15**	4280	5920	46540	69460	70	38	247
	55	13	**70 UHC 30 A25**	4320	6770	39350	58730	110	100	217
35	55	10	**719 UHC 35 A15**	3430	4250	44840	66940	70	40	258
	55	10	**719 UHC 35 A25**	3250	4080	37870	56530	110	107	227
	62	14	**70 UHC 35 A15**	4920	7570	40780	60860	80	44	290
	62	14	**70 UHC 35 A25**	5200	7150	34490	51470	130	116	255
40	62	12	**719 UHC 40 A15**	4680	6090	39580	59060	80	44	294
	62	12	**719 UHC 40 A25**	4440	5740	33420	49880	130	116	259
	68	15	**70 UHC 40 A15**	6060	7690	36640	54670	90	46	301
	68	15	**70 UHC 40 A25**	5750	7250	30970	46220	145	122	266
45	68	12	**719 UHC 45 A15**	5120	6310	35710	53300	90	47	323
	68	12	**719 UHC 45 A25**	4860	5940	30170	45020	145	125	284
	75	16	**70 UHC 45 A15**	8460	10160	32960	49200	120	54	360
	75	16	**70 UHC 45 A25**	8040	9590	27880	41600	195	144	316
50	72	12	**719 UHC 50 A15**	5350	6550	33080	49380	100	51	340
	72	12	**719 UHC 50 A25**	5080	6180	27940	41700	165	135	299
	80	16	**70 UHC 50 A15**	9800	10330	30430	45420	130	58	374
	80	16	**70 UHC 50 A25**	9310	9770	25730	38400	210	153	329
55	80	13	**719 UHC 55 A15**	9580	8550	29900	44630	130	59	385
	80	13	**719 UHC 55 A25**	9090	8040	25260	37690	210	155	339
	90	18	**70 UHC 55 A15**	10780	12770	27280	40720	170	64	436
	90	18	**70 UHC 55 A25**	10240	12060	23060	34430	275	170	383
60	85	13	**719 UHC 60 A15**	9360	8620	27840	41540	140	63	417
	85	13	**719 UHC 60 A25**	8880	8100	23510	35090	230	168	367
	95	18	**70 UHC 60 A15**	11940	13010	25520	38090	180	69	453
	95	18	**70 UHC 60 A25**	11340	12210	21580	32210	295	183	399
65	90	13	**719 UHC 65 A15**	9800	8910	26040	38870	150	68	446
	90	13	**719 UHC 65 A25**	9310	8390	21980	32820	245	179	392
	100	18	**70 UHC 65 A15**	12490	13130	23980	35780	190	74	484
	100	18	**70 UHC 65 A25**	11860	12380	20270	30250	310	184	426
70	100	16	**719 UHC 70 A15**	12920	11470	23750	35440	170	74	488
	100	16	**719 UHC 70 A25**	12270	10800	20050	29930	275	184	429
	110	20	**70 UHC 70 A15**	16840	18890	21970	32800	230	82	543
	110	20	**70 UHC 70 A25**	15990	17830	18580	27730	375	216	477

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	Ø ⦰	f_3 =	**1,0**
DT	ØØ ⦰⦰	=	**0,95**
DB	Ø⦰ Ø⦰	=	**0,9**
TBT	ØØ⦰ Ø⦰	=	**0,75**
QBC	ØØ⦰⦰ Ø⦰	=	**0,85**

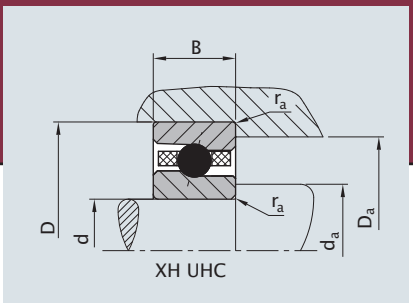
Single Row, with fibre cage,
preloaded,
Contact Angle α: A15 = 15°, A25 = 25°

Dimensions of Series 719/70

Nominal Size			UKF Type	Ratings		Speed Limit n_{lim}RPM		axial Preload L	Rigidity axial	N/µm radial
d	D	B		C_0	C	Grease lubrication	minimum oil lubrication	F_v N	R_a	R_r
	mm			N	N					
75	105	16	**719 UHC 75 A15**	13590	11570	22430	33470	180	77	515
	105	16	**719 UHC 75 A25**	12900	10890	18950	28270	295	205	453
	115	20	**70 UHC 75 A15**	17820	19230	20820	31070	240	85	561
	115	20	**70 UHC 75 A25**	16930	18060	17600	26270	390	225	493
80	110	16	**719 UHC 80 A15**	14260	11700	21240	31700	190	83	542
	110	16	**719 UHC 80 A25**	13540	11010	17940	26780	310	220	476
	125	22	**70 UHC 80 A15**	22500	22550	19300	28800	290	94	627
	125	22	**70 UHC 80 A25**	21370	21170	16310	24350	475	250	552
85	120	18	**719 UHC 85 A15**	18490	17290	19690	29390	220	89	588
	120	18	**719 UHC 85 A25**	17560	16270	16630	24820	360	235	518
	130	22	**70 UHC 85 A15**	25610	22900	18400	27460	300	98	649
	130	22	**70 UHC 85 A25**	24330	21490	15550	23220	490	259	570
90	125	18	**719 UHC 90 A15**	19380	17500	18770	28020	260	95	637
	125	18	**719 UHC 90 A25**	18400	16470	15850	23660	425	253	561
	140	24	**70 UHC 90 A15**	30740	26330	17200	25670	360	108	728
	140	24	**70 UHC 90 A25**	29200	26010	14540	21710	585	286	641
100	140	20	**719 UHC 100 A15**	26280	21180	16820	25100	310	105	702
	140	20	**719 UHC 100 A25**	24970	19930	14210	21200	505	277	618
	150	24	**70 UHC 100 A15**	34970	29080	15830	23620	380	115	764
	150	24	**70 UHC 100 A25**	33220	27620	13380	19970	620	305	672
110	150	20	**719 UHC 110 A15**	27620	21700	15530	23170	330	115	756
	150	20	**719 UHC 110 A25**	26240	20430	13120	19570	535	305	665
	170	28	**70 UHC 110 A15**	44550	39860	14120	21080	500	130	852
	170	28	**70 UHC 110 A25**	42320	37420	11950	17830	815	344	750
120	165	22	**719 UHC 120 A15**	34970	25930	14160	21130	390	125	838
	165	22	**719 UHC 120 A25**	33220	24400	11960	17860	635	332	738
	180	28	**70 UHC 120 A15**	47670	41180	13190	19680	510	138	903
	180	28	**70 UHC 120 A25**	45280	38720	11150	16640	830	366	795
130	180	24	**719 UHC 130 A15**	41210	33300	13020	19430	470	137	902
	180	24	**719 UHC 130 A25**	39140	31350	11000	16420	765	362	794
	200	33	**70 UHC 130 A15**	60850	55740	11990	17890	650	153	1007
	200	33	**70 UHC 130 A25**	57810	52420	10140	15130	1060	405	887
140	190	24	**719 UHC 140 A15**	44550	34220	12230	18250	500	143	937
	190	24	**719 UHC 140 A25**	42320	32200	10330	15420	815	378	825
	210	33	**70 UHC 140 A15**	65040	56210	11300	16870	660	156	1038
	210	33	**70 UHC 140 A25**	61790	52960	9560	14270	1070	414	914
150	210	28	**719 UHC 150 A15**	59250	44040	11210	16730	620	161	1068
	210	28	**719 UHC 150 A25**	56290	41450	9470	14140	1010	427	941
	225	35	**70 UHC 150 A15**	97900	67820	10550	15740	770	168	1116
	225	35	**70 UHC 150 A25**	93010	62920	8920	13310	1250	445	982

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 d	D	B	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	axial Preload L F_v N	Rigidity axial R_a	N/µm radial R_r
	mm									
20	37	9	**XH 719 UHC 20 A15**	2360	7220	81430	121540	40	24	167
	37	9	**XH 719 UHC 20 A25**	2250	6850	68780	102660	65	64	147
	42	12	**XH 70 UHC 20 A15**	3700	9650	73370	109500	50	28	184
	42	12	**XH 70 UHC 20 A25**	3520	9160	62040	92600	80	74	162
25	42	9	**XH 719 UHC 25 A15**	2790	7690	69280	103400	50	30	192
	42	9	**XH 719 UHC 25 A25**	2650	7250	58510	87330	80	79	169
	47	12	**XH 70 UHC 25 A15**	4230	10400	63180	94300	60	32	213
	47	12	**XH 70 UHC 25 A25**	4010	9860	53420	79740	95	85	187
30	47	9	**XH 719 UHC 30 A15**	3210	8090	60280	89960	60	36	230
	47	9	**XH 719 UHC 30 A25**	3020	7630	50910	75980	95	94	202
	55	13	**XH 70 UHC 30 A15**	5560	11830	53520	79870	70	38	247
	55	13	**XH 70 UHC 30 A25**	5610	13540	45250	67540	110	100	217
35	55	10	**XH 719 UHC 35 A15**	4450	8500	51570	76980	70	40	258
	55	10	**XH 719 UHC 35 A25**	4230	8160	43550	65010	110	107	227
	62	14	**XH 70 UHC 35 A15**	7010	15150	46890	69990	80	44	290
	62	14	**XH 70 UHC 35 A25**	6760	14290	39660	59190	130	116	255
40	62	12	**XH 719 UHC 40 A15**	6080	12180	45510	67920	80	44	294
	62	12	**XH 719 UHC 40 A25**	5770	11480	38430	57370	130	116	259
	68	15	**XH 70 UHC 40 A15**	7870	15370	42130	62870	90	46	301
	68	15	**XH 70 UHC 40 A25**	7470	14490	35620	53160	145	122	266
45	68	12	**XH 719 UHC 45 A15**	6660	12610	41070	61300	90	47	323
	68	12	**XH 719 UHC 45 A25**	6320	11890	34690	51780	145	125	284
	75	16	**XH 70 UHC 45 A15**	11000	20310	37910	56580	120	54	360
	75	16	**XH 70 UHC 45 A25**	10450	19180	32060	47840	195	144	316
50	72	12	**XH 719 UHC 50 A15**	6950	13090	38050	56790	100	51	340
	72	12	**XH 719 UHC 50 A25**	6600	12360	32130	47960	165	135	299
	80	16	**XH 70 UHC 50 A15**	12740	20650	35000	52230	130	58	374
	80	16	**XH 70 UHC 50 A25**	12100	19530	29590	44160	210	153	329
55	80	13	**XH 719 UHC 55 A15**	12450	17090	34390	51320	130	59	385
	80	13	**XH 719 UHC 55 A25**	11820	16070	29050	43350	210	155	339
	90	18	**XH 70 UHC 55 A15**	14010	25540	31370	46820	170	64	436
	90	18	**XH 70 UHC 55 A25**	13310	24120	26520	39590	275	170	383
60	85	13	**XH 719 UHC 60 A15**	12160	17250	32020	47780	140	63	417
	85	13	**XH 719 UHC 60 A25**	11550	16200	27030	40350	230	168	367
	95	18	**XH 70 UHC 60 A15**	15520	26010	29350	43800	180	69	453
	95	18	**XH 70 UHC 60 A25**	14740	24420	24810	37040	295	183	399
65	90	13	**XH 719 UHC 65 A15**	12740	17820	29950	44700	150	68	446
	90	13	**XH 719 UHC 65 A25**	12100	16790	25280	37740	245	179	392
	100	18	**XH 70 UHC 65 A15**	15620	26250	27570	41150	190	74	484
	100	18	**XH 70 UHC 65 A25**	14840	24770	23310	34790	310	184	426
70	100	16	**XH 719 UHC 70 A15**	16800	22930	27310	40750	170	74	488
	100	16	**XH 719 UHC 70 A25**	15950	21600	23060	34420	275	184	429
	110	20	**XH 70 UHC 70 A15**	21890	37770	25270	37720	230	82	543
	110	20	**XH 70 UHC 70 A25**	20790	35660	21360	31890	375	216	477

Bearing Sets and Calculation Factor f_3 for Speed Limit

Single Row	Ø	⦸	**f_3 = 1,0**
DT	ØØ	⦸⦸	**= 0,95**
DB	Ø⦸	Ø⦸	**= 0,9**
TBT	ØØ⦸	Ø⦸	**= 0,75**
QBC	ØØ⦸⦸	Ø⦸	**= 0,85**

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

Dimensions of Series 719/70

Nominal Size d	D	B	UKF Type	C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	Speed Limit n_{lim}RPM minimum oil lubrication	axial Preload L F_v N	Rigidity axial R_a	N/µm radial R_r
	mm									
75	105	16	**XH 719 UHC 75 A15**	17660	23140	25790	38490	180	77	515
	105	16	**XH 719 UHC 75 A25**	16770	21780	21790	32510	295	205	453
	115	20	**XH 70 UHC 75 A15**	23170	38460	23940	35730	240	85	561
	115	20	**XH 70 UHC 75 A25**	22010	36120	20240	30210	390	225	493
80	110	16	**XH 719 UHC 80 A15**	18530	23410	24430	36460	190	83	542
	110	16	**XH 719 UHC 80 A25**	17600	22020	20630	30800	310	220	476
	125	22	**XH 70 UHC 80 A15**	29240	45090	22190	33120	290	94	627
	125	22	**XH 70 UHC 80 A25**	27780	42340	18750	28000	475	250	552
85	120	18	**XH 719 UHC 85 A15**	24030	34580	22650	33800	220	89	588
	120	18	**XH 719 UHC 85 A25**	22820	32540	19130	28540	360	235	518
	130	22	**XH 70 UHC 85 A15**	33300	45790	21160	31570	300	98	649
	130	22	**XH 70 UHC 85 A25**	31630	42980	17880	26700	490	259	570
90	125	18	**XH 719 UHC 90 A15**	25190	35000	21580	32220	260	95	637
	125	18	**XH 719 UHC 90 A25**	23920	32940	18230	27210	425	253	561
	140	24	**XH 70 UHC 90 A15**	39960	52670	19780	29520	360	108	728
	140	24	**XH 70 UHC 90 A25**	37960	51200	16730	24960	585	286	641
100	140	20	**XH 719 UHC 100 A15**	34170	42350	19350	28870	310	105	702
	140	20	**XH 719 UHC 100 A25**	32460	39860	16340	24380	505	277	618
	150	24	**XH 70 UHC 100 A15**	45460	58160	18200	27160	380	115	764
	150	24	**XH 70 UHC 100 A25**	43190	55250	15390	22960	620	305	672
110	150	20	**XH 719 UHC 110 A15**	35910	43400	17860	26650	330	115	756
	150	20	**XH 719 UHC 110 A25**	34110	40850	15080	22510	535	305	665
	170	28	**XH 70 UHC 110 A15**	57920	79720	16240	24250	500	130	852
	170	28	**XH 70 UHC 110 A25**	55020	74830	13740	20510	815	344	750
120	165	22	**XH 719 UHC 120 A15**	45460	51860	16280	24300	390	125	838
	165	22	**XH 719 UHC 120 A25**	43190	48800	13760	20530	635	332	738
	180	28	**XH 70 UHC 120 A15**	61970	82360	15170	22630	510	138	903
	180	28	**XH 70 UHC 120 A25**	58870	77430	12820	19140	830	366	795
130	180	24	**XH 719 UHC 130 A15**	53570	66600	14970	22340	470	137	902
	180	24	**XH 719 UHC 130 A25**	50890	62690	12650	18880	765	362	794
	200	33	**XH 70 UHC 130 A15**	79110	111480	13790	20580	650	153	1007
	200	33	**XH 70 UHC 130 A25**	75150	104850	11660	17400	1060	405	887
140	190	24	**XH 719 UHC 140 A15**	57920	68430	14060	20990	500	143	937
	190	24	**XH 719 UHC 140 A25**	55020	64400	11880	17730	815	378	825
	210	33	**XH 70 UHC 140 A15**	84560	112420	13000	19400	660	156	1038
	210	33	**XH 70 UHC 140 A25**	80320	105910	11000	16410	1070	414	914
150	210	28	**XH 719 UHC 150 A15**	77030	88070	12890	19240	620	161	1068
	210	28	**XH 719 UHC 150 A25**	73170	82890	10890	16260	1010	427	941
	225	35	**XH 70 UHC 150 A15**	127270	135630	12130	18110	770	168	1116
	225	35	**XH 70 UHC 150 A25**	120910	125850	10250	15300	1250	445	982

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 stabile 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: "2Z", for ex. 719 UHC 50.A15.**2Z**.O/I.L

Lubrication

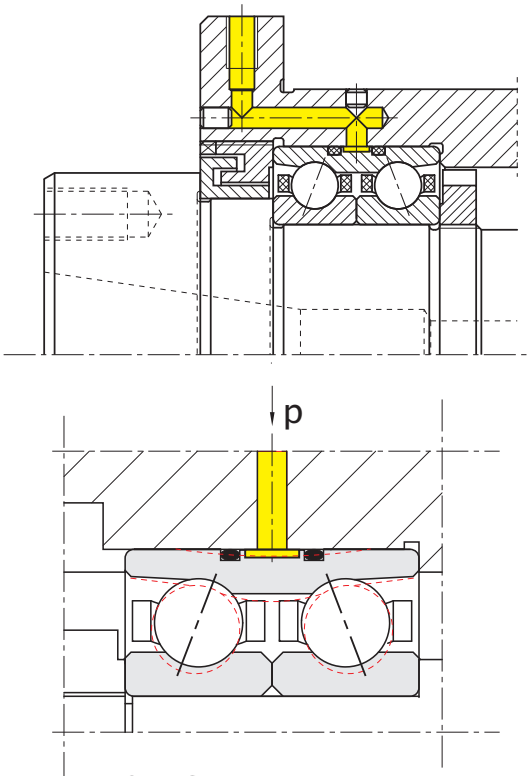
As an alternative to an axial lubricant supply using, for example a distance ring (→ Distance Ring), lubricant can be supplied radially, directly through the Outer Ring into the raceway.
The bearing is specially configured with an annular groove in the Outer Ring, which distributes the lubricant to several 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.

Type Series 718

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

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

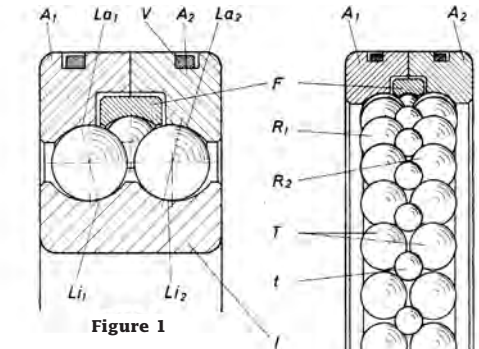


Figure 1

Figure 3

Figure 2

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 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 but with even more balls in each 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.

Reliable precision over a long lifetime,

many load carrying balls,

ideal Spindle Bearing for headstocks

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.

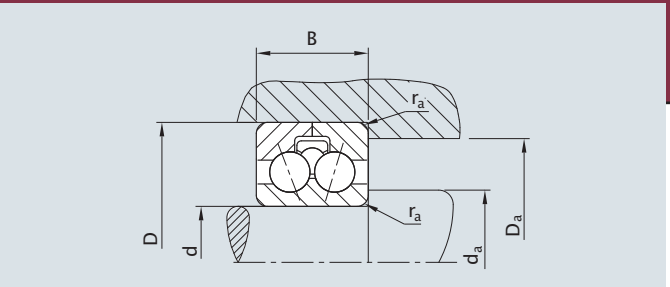
Fig. 2: When the inner ring rotates in direction of the arrow, the load carrying balls, T, follow in the same direction and rotate as shown in the figure. In this example, the Spacer Balls, t, respectively, revolve around their axis as shown, due to their contact with the load-carrying balls. Similarly,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

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.

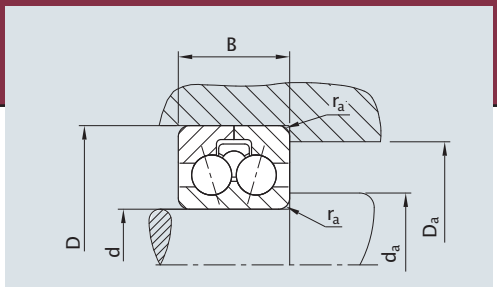


Double Row, with rolling ball guidance (Spacer Balls), preloaded, Contact Angle α = 16°

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

Nominal Size d	D	B	UKF Type		Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a	d_a	D_a mm	Mass m 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

Series UL, UM



Double Row, with rotating Spacer Balls
preloaded,
Contact Angle α = 16°

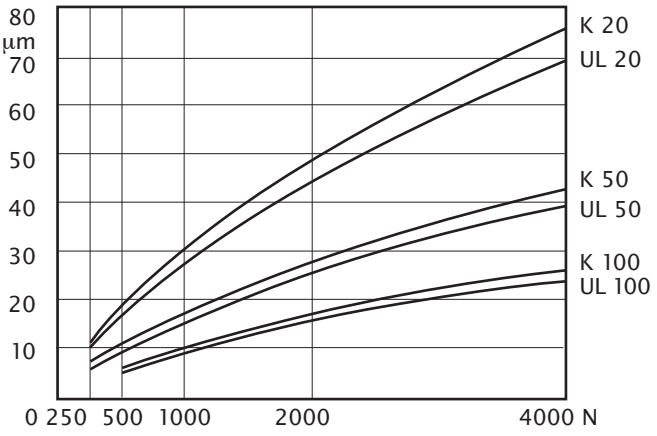
Dimensions: UL like Bearings of Series 72
UM like Bearings of Series 73

Nominal Size d	D	B	UKF Type		Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	minimum oil lubrication	Seat Dimensions r_a	d_a	D_a	Mass m kg
	mm								mm			
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

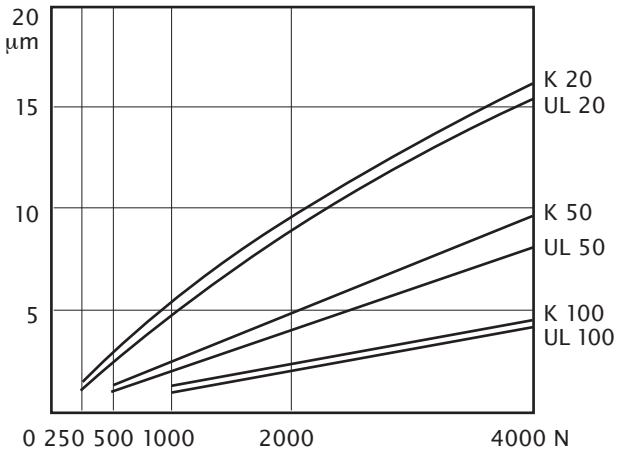
Elasticity and Rigidity

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 N and axial forces F_a = 1000 N, speed is n = 1000 RPM

Ratings: Static	C_o = 32400 N
Dynamic	C = 34600 N
Speed Factor	f_n = 0,322

Calculate, as follows:

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

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

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

X = 1 Y= 1,46

The dynamic equivalent load is therefore:

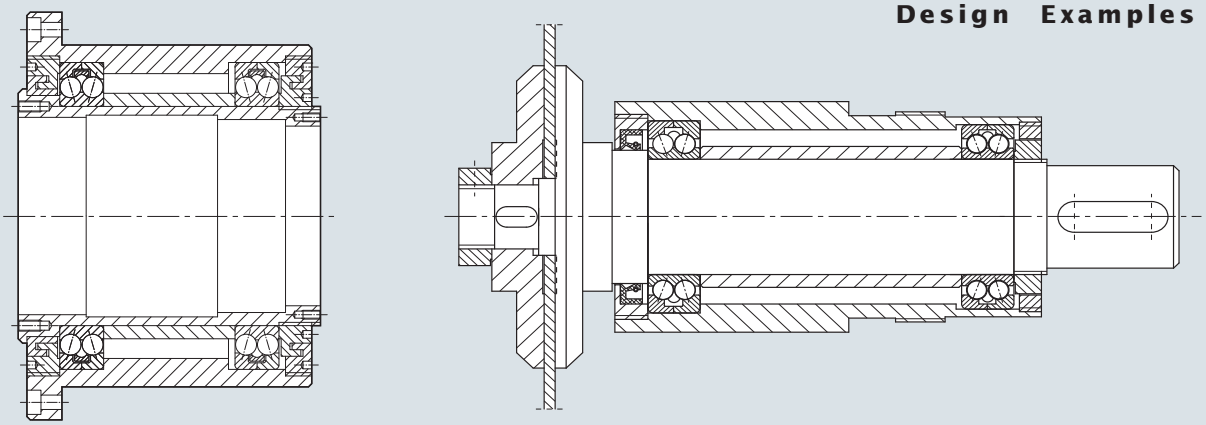
$$P = X \cdot F_r + Y \cdot F_a = 1 \cdot 2500\ N + 1{,}46 \cdot 1000 = 3960\ N$$

Now the value for the dynamic load can be found:

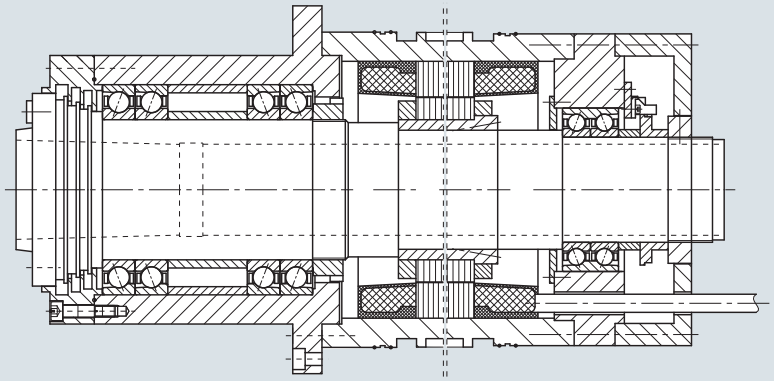
$$f_L = \frac{C}{P} \cdot f_n = \frac{34600\ N \cdot 0{,}322}{3960\ N} = 2{,}81$$

This yields a nominal lifetime of L_h = 11000 h.

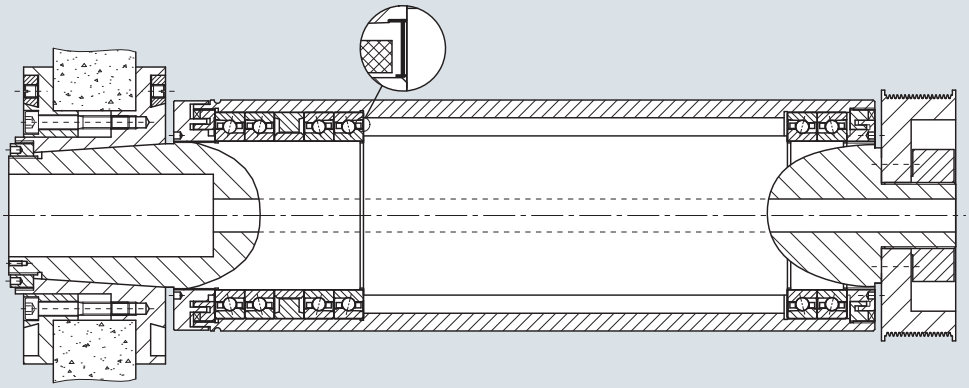
Design Examples



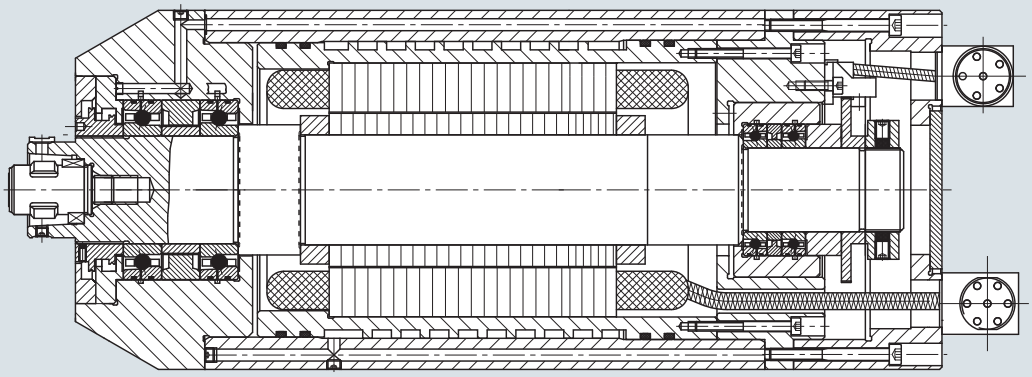
Bearing Arrangement, Cut-off Saw Spindle



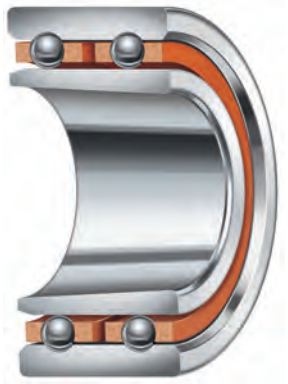
High Frequency Turning Spindle designed with Spindle Bearings USS and USO



Surface Grinding Spindle using sealed High Speed Spindle Bearings UHS “2Z”



HSC-Spindle fitted with Spindle Bearings designed for direct lubrication “LB”

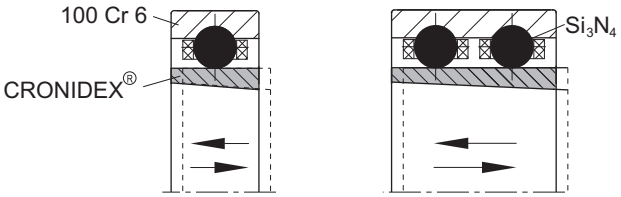


70 AF..
one-part Inner- and Outer Rings
Cylindrical Inner Ring
Axially non-constraining,
floating bearing design

70 AFDC double row

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. This 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 stabile 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.



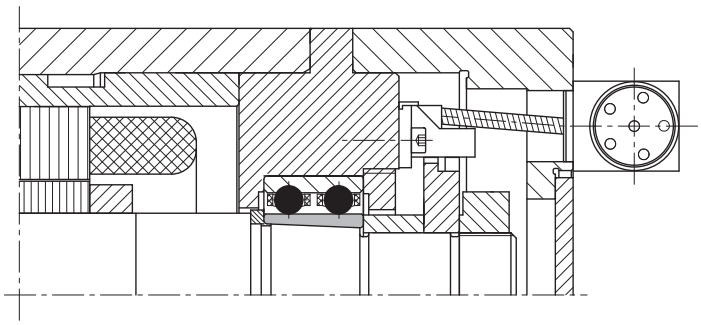
Single Row Design AFSC
for lower loads and high speeds

Options: Shields (2Z)
with Grease Lubrication for life
→ page 28

Direct Lubrication (LB)
to the Outer Ring races
→ page 28

At lower speed it is possible to fit the bearings with steel balls.

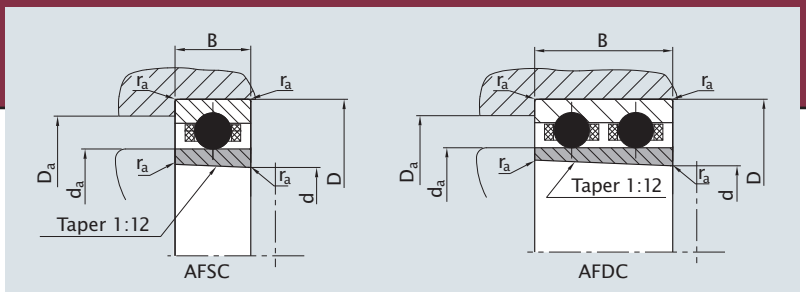
Design Example



Floating Bearing “AFDC”

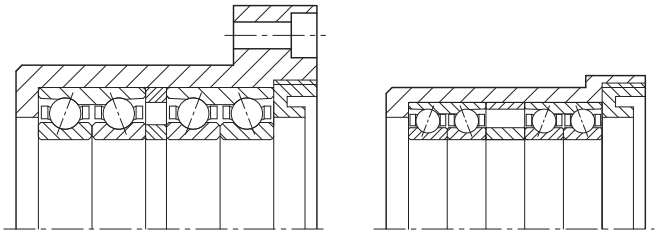
UKF Floating Bearing
Series AFSC, 70 AFDC

One-part Inner- and Outer Rings,
cylindrical bearing races on the
Inner Ring CRONIDEX®
- Floating Bearing with integrated Axial Displacement

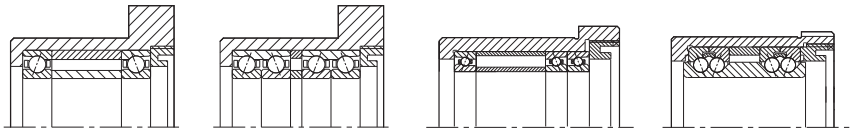


Nominal Size d	D mm	B mm	UKF Type	Ratings C_0 N	C N	Speed Limit n_{lim}RPM Grease lubrication	Speed Limit n_{lim}RPM minimum oil lubrication	Seat Dimensions r_a mm	Seat Dimensions d_a mm	Seat Dimensions D_a mm	Mass m kg
20	42	12	**70 AFSC 20**	416	4860	48000	73600	0,3	24,0	37,0	0,07
	42	24	**70 AFDC 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

Designs with flanges or collars



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



Spindle Bearings
LKSS (C)

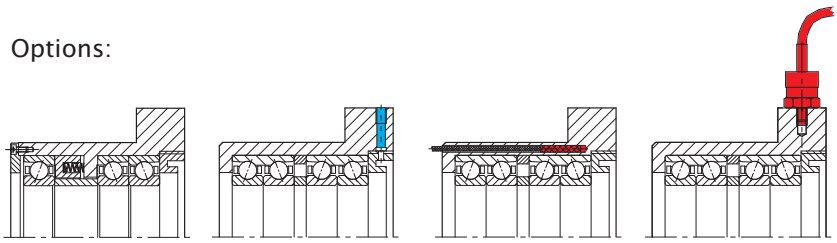
Spindle Bearings
LKSO (C)

High Speed
Spindle Bearings
LKHS(C)

Spindle Bearings
LS
with Spacer Balls

Integrated Bearing Set
preloaded
labyrinth seal
ready to assemble

Options:

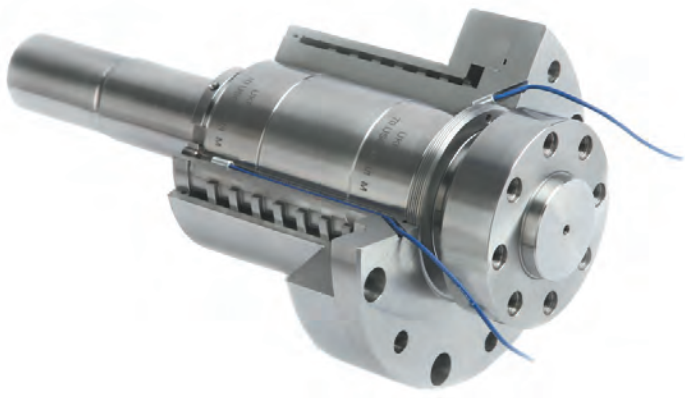


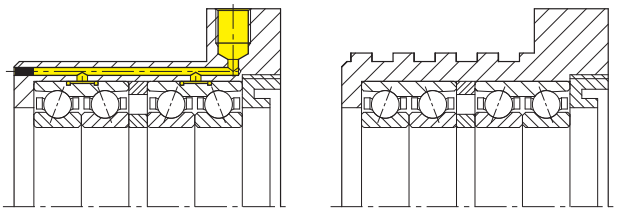
FA
Springs

SL
Air Purge

TS
Temperature-
Monitoring

VS
Vibration
Monitoring





VR
variable
preload
VARIORING

FK
liquid cooled
jacket

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

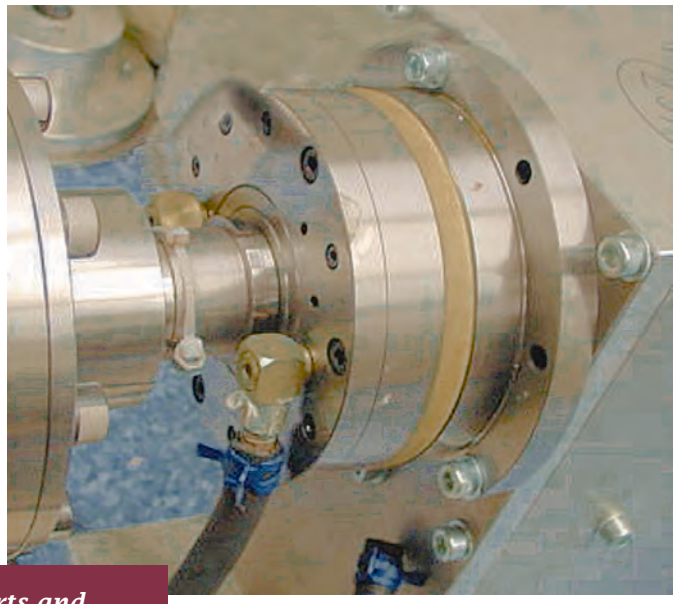
(P)LKSO… respectively, (P)LKSOC…
assembled with Spindle Bearings 70 or 719, alternatively Hybrid Bearings with Ceramic Balls ("…C"). Note: "P" Prefix indicates smaller sleeve, reduced outer diameter; collar instead of a flange.

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 seas 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 working operations

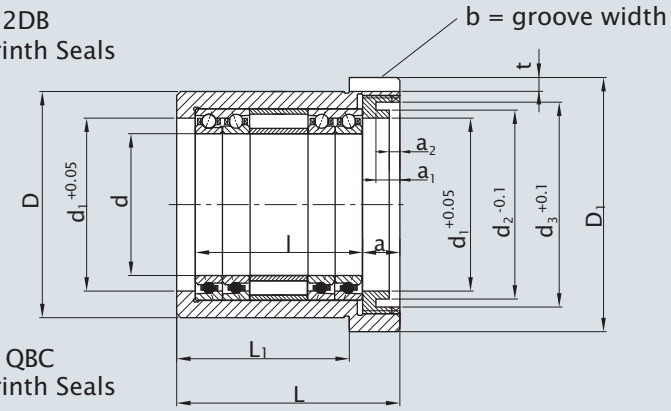
shortens idle times

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.

PLKSO . . . 2DB
with Labyrinth Seals



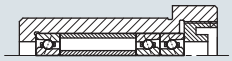
PLKHC . . . QBC
with Labyrinth Seals

Outer sleeve available with a flange in lieu of collar

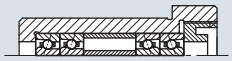
Possible bearing configurations

...DB

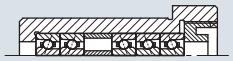
...TBT



...QBC

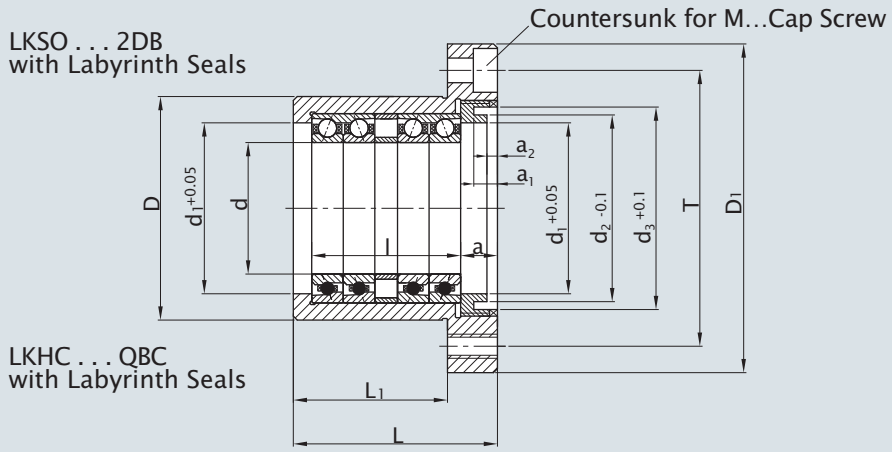


...PBC



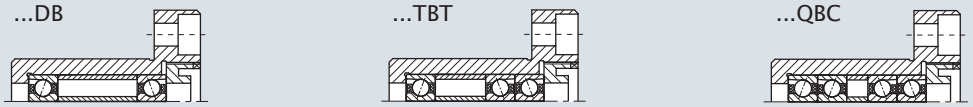
Dimensions are in mm; external dimensions are maintained, regardless of internal bearing configuration:

UKF Type		d	D	D_1	d_1	d_2	d_3	L	L_1	l	a	a_1	a_2	t	b
	25	25	50	57	35	39	45	70	56	55	10	8	3	2,5	5,1
	30	30	55	62	42	47	53	75,5	60	59	11,5	9	3,5		
	35	35	65	73	46	51	57	79,5	64	63	11,5	9	3,5		
	40	40	72	80	52	57	63	84,5	69	67	11,5	9	3,5		
	45	45	78	86	57	63	69	89	73	71	12	8	4		
	50	50	85	93	65	71	77	92	73	71	14	9	4	3	6,1
	55	55	90	98	69	75	81	101	81	79	14,5	10	4		
	60	60	95	103	75	82	89	101	81	79	14,5	10	4		
PLK S.	**65**	65	100	108	82	88	94	104	81	79	17	12	5		
resp.	**70**	70	110	118	86	92	99	112	89	87	17	12	5		
PLK H.	**75**	75	115	123	92	98	105	112	89	87	17	12	5	3,5	7,1
	80	80	120	128	100	106	113	120	96	95	18	12	5		
	85	85	130	138	103	109	116	121	97	95	18	12	5		
	90	90	140	150	112	118	126	128	104	103	17	12	5		
	100	100	155	165	124	131	139	131	106	103	18	13	5		
	110	110	165	175	137	144	152	150	123	119	20	14	7		
	120	120	180	190	147	153	161	148	121	119	17	14	7	4	8,1
	130	130	195	205	160	168	178	170	141	139	19	14	7		
	140	140	205	215	170	180	190	173	141	139	22	15	7		
	150	150	225	235	185	195	205	182	149	147	23	15	7		



Outer sleeve available with collar in lieu of flange

Possible bearing configurations

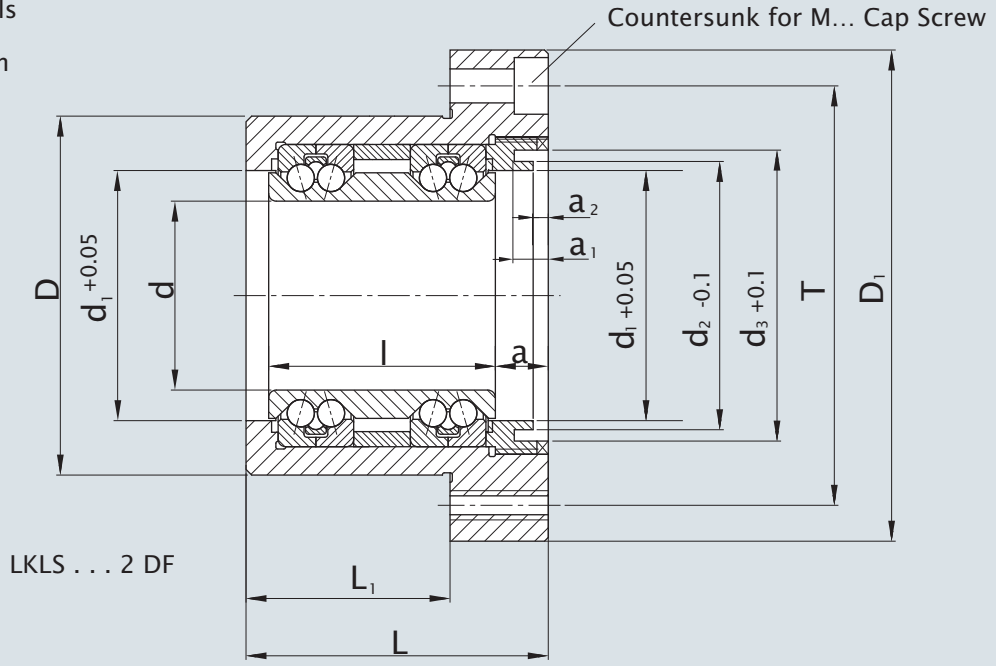


Dimensions are in mm; external dimensions are maintained, regardless of internal bearing configuration:

UKF Type		d	D	D_1	d_1	d_2	d_3	T	Screw Size	L	L_1	l	a	a_1	a_2
	25	25	62	85	35	39	45	71		70	50	55	10	8	3
	30	30	68	95	42	47	53	78	M6	75,5	53,5	59	11,5	9	3,5
	35	35	72	95	46	51	57	82	3 x 120°	79,5	57,5	63	11,5	9	3,5
	40	40	80	105	52	57	63	90		84,5	61,5	67	11,5	9	3,5
	45	45	90	125	57	63	69	105	M8	89	67	71	12	8	4
	50	50	95	130	65	71	77	111	3 x 120°	92	66	71	14	9	4
	55	55	105	140	69	75	81	120		101	74	79	14,5	10	4
	60	60	110	150	75	82	89	128		101	73	79	14,5	10	4
LK S.	**65**	65	120	160	82	88	94	137		104	75	79	17	12	5
resp.	**70**	70	125	165	86	92	99	143	M10	112	81	87	17	12	5
	75	75	130	170	92	98	105	148	3 x 120°	112	80	87	17	12	5
LK H.	**80**	80	140	180	100	106	113	160		120	88	95	18	12	5
	85	85	150	190	103	109	116	168		121	89	95	18	12	5
	90	90	160	200	112	118	126	177	M10	128	95	103	17	12	5
	95	95	170	215	116	123	130	190	4 x 90°	129	95	103	17	12	5
	100	100	180	225	124	131	139	200		131	96	103	18	13	5
	110	110	200	245	137	144	152	220	M12	150	109	119	20	14	7
	120	120	210	255	147	153	161	230	4 x 90°	148	108	119	17	14	7
	130	130	230	280	160	168	178	255		170	127	139	19	14	7
	140	140	250	300	170	180	190	270	M12	173	126	139	22	15	7
	150	150	270	320	185	195	205	290	5 x 72°	182	135	147	23	14	7

with rolling guidance of balls
and Labyrinth Seals

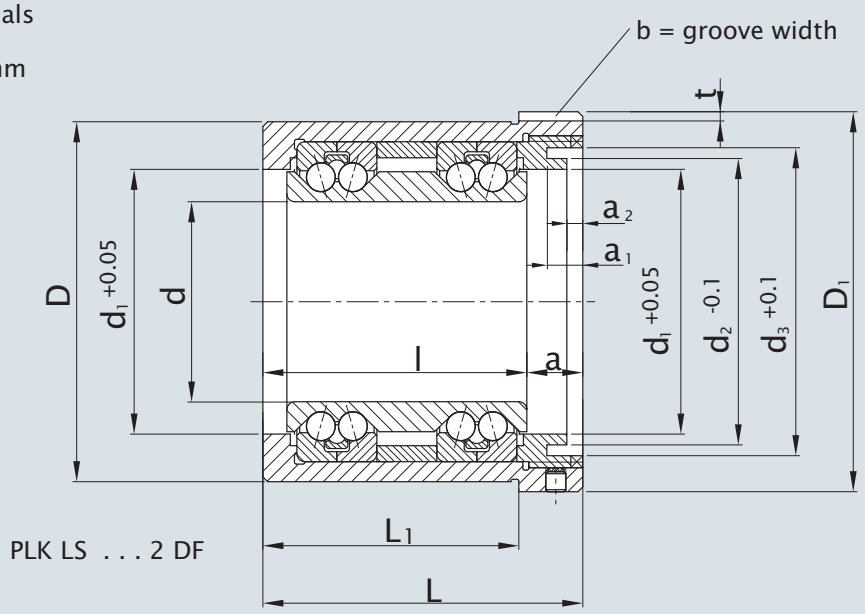
Dimensions in mm



UKF Type	d	D	D_1	d_1	d_2	d_3	T	Screw Size	L	L_1	l	a	a_1	a_2
LKLS 25	25	62	85	35	39	45	71		60	40	45	10	8	3
LKLS 30	30	68	95	42	47	53	78	M6	66	44	50	11,5	9	3,5
LKLS 35	35	72	95	46	51	57	82	3 x 120°	66	44	50	11,5	9	3,5
LKLS 40	40	80	105	52	57	63	90		61	44	50	11,5	9	3,5
LKLS 45	45	90	125	57	63	69	105		72	50	55	12	8	4
LKLS 50	50	95	130	65	71	77	111	M8	80	54	60	14	9	4
LKLS 55	55	105	140	69	75	81	120	3 x 120°	87	60	65	14,5	10	4
LKLS 60	60	110	150	75	82	89	128		87	59	65	14,5	10	4
LKLS 65	65	120	160	82	88	94	137		95	66	70	17	12	5
LKLS 70	70	125	165	86	92	99	143		100	69	75	17	12	5
LKLS 75	75	130	170	92	98	105	148	M10	105	73	80	17	12	5
LKLS 80	80	140	180	100	106	113	160	3 x 120°	110	78	85	18	12	5
LKLS 85	85	150	190	103	109	116	168		118	86	90	18	12	5
LKLS 90	90	160	200	112	118	126	177		125	92	100	17	12	5
LKLS 95	95	170	215	116	123	130	190	M10	133	99	105	17	12	5
LKLS 100	100	180	225	124	131	139	200	4 x 90°	140	105	110	18	13	5
LKLS 105	105	190	235	130	136	144	210		150	114	120	18	14	6
LKLS 110	110	200	245	137	144	152	220	M12	157	116	125	20	14	7
LKLS 120	120	210	255	147	153	161	230	4 x 90°	160	120	130	17	14	7
LKLS 130	130	230	280	160	168	178	255		172	129	140	19	14	7
LKLS 140	140	250	300	170	180	190	270	M12	184	137	160	22	15	7
LKLS 150	150	270	320	185	195	205	290	5 x 72°	195	148	160	23	14	7

with rolling guidance of balls
and Labyrinth Seals

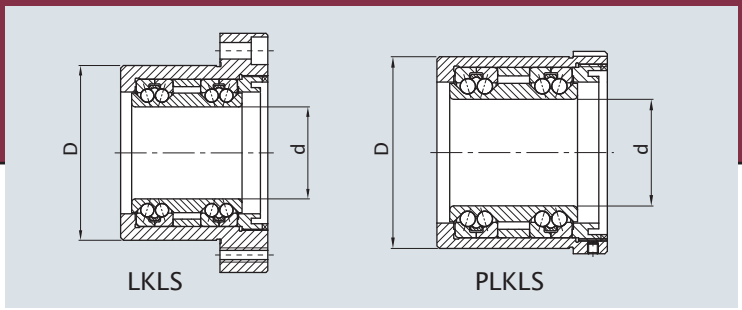
Dimensions in mm



PLK LS . . . 2 DF

UKF Type	d	D	D_1	d_1	d_2	d_3	L	L_1	l	a	a_1	a_2	t	b
PLKLS 25	25	55	60	35	39	45	60	47	45	10	8	3		
PLKLS 30	30	65	70	42	47	53	66	52	50	11,5	9	3,5		
PLKLS 35	35	68	75	46	51	57	66	52	60	11,5	9	3,5		
PLKLS 40	40	75	80	52	57	63	61	53	50	11,5	9	3,5		
PLKLS 45	45	80	85	57	63	69	72	57	55	12	8	4	2,3	4,1
PLKLS 50	50	90	95	65	71	77	80	64	60	14	9	4		
PLKLS 55	55	95	100	69	75	81	87	70	65	14,5	10	4		
PLKLS 60	60	100	105	75	82	89	87	69	65	14,5	10	4		
PLKLS 65	65	110	115	82	88	94	95	76	70	17	12	5		
PLKLS 70	70	115	120	86	92	99	100	80	75	17	12	5	2,5	5,1
PLKLS 75	75	122	130	92	98	105	105	85	80	17	12	5		
PLKLS 80	80	132	140	100	106	113	110	90	85	18	12	5		
PLKLS 85	85	138	145	103	109	116	118	98	90	18	12	5		
PLKLS 90	90	150	160	112	118	126	125	103	100	17	12	5		
PLKLS 95	95	155	165	116	123	130	133	108	105	17	12	5	3	6,1
PLKLS 100	100	165	175	124	131	139	140	115	110	18	13	5		
PLKLS 105	105	180	190	130	136	144	150	125	120	18	14	6		
PLKLS 110	110	190	200	137	144	152	157	131	125	20	14	7		
PLKLS 120	120	200	210	147	153	161	160	133	130	17	14	7		
PLKLS 130	130	215	225	160	168	178	172	143	140	19	14	7	3	7,1
PLKLS 140	140	235	245	170	180	190	184	153	160	22	15	7		
PLKLS 150	150	250	260	185	195	205	195	162	160	23	14	7		

UKF Bearing Cartridges
Type LKLS, PLKLS



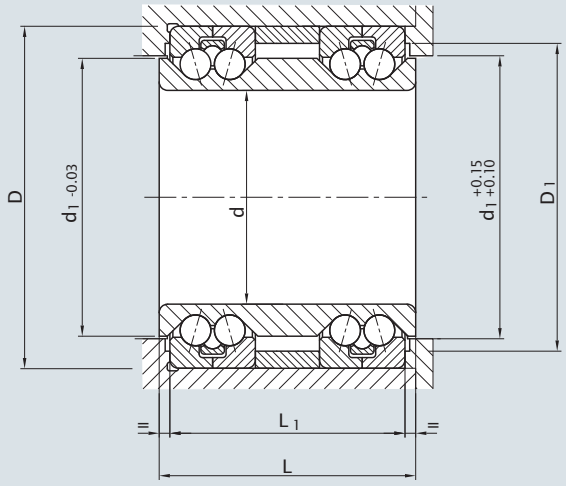
LKLS PLKLS

2 x 2 tracks with rolling guidance of balls
and Labyrinth Seals
preloaded, Contact Angle α = 16°

d	D	UKF Type		Ratings C_0	Ratings C	Speed Limit n_{lim}RPM Grease lubrication	Speed Limit n_{lim}RPM minimum oil lubrication	Mass
mm	mm			N	N			kg
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

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.



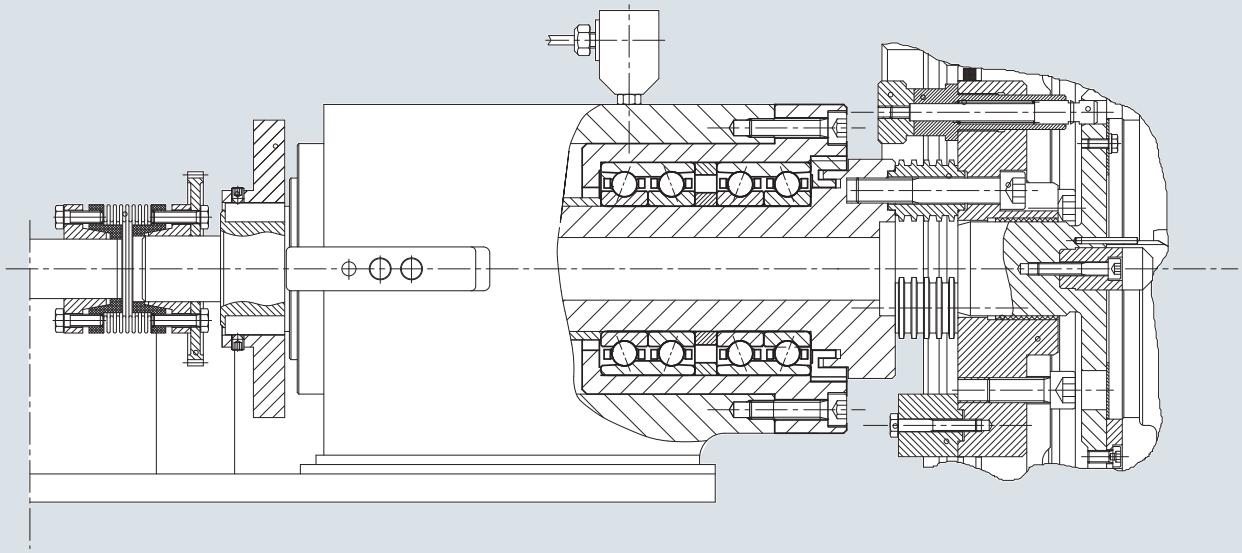
Bearing Cartridge System LS

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

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

Design Example



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

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 µm, (bore d < 50 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 µm, respectively, 1,5 µm. 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 µm 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.

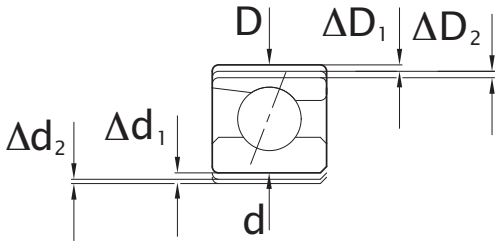
UKF	more precise than		
Grade	ISO	DIN	ABEC
HQ	Non-standardized, Ultra Precision		
0	2	P2	9
I	4	P4	7
1, 1/2	5	P5	5

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}

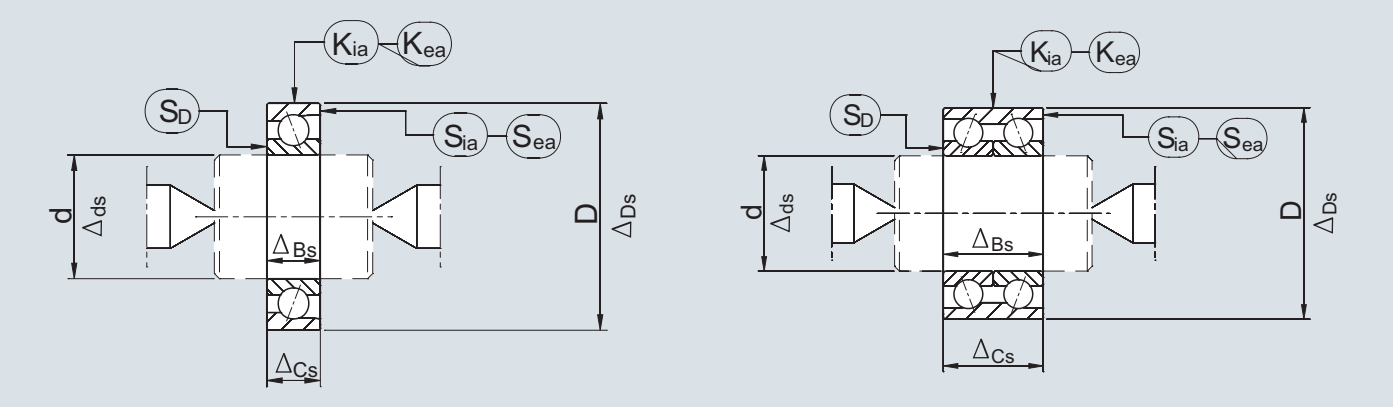
Inner Ring

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



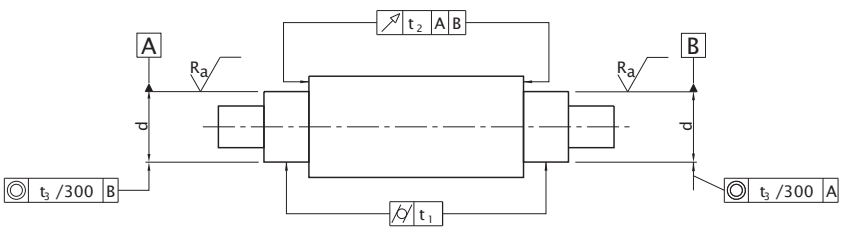
Running Precision, values in µm

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)] otherwise as UKF 0 [2)] otherwise as UKF I

Dimensional Accuracy, values in µm

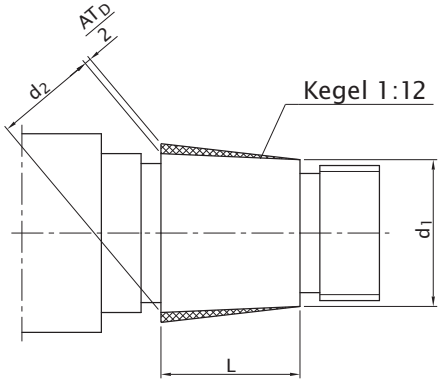
d/D in mm		bis	18	30	50	80	120	150	180	250	315	400	Class
IR (d)	Δ_{ds}	0...	-5	-5	-6	-7	-8	-10	-10	-12	-	-	
	Δ_{Bs}	0...	-60	-70	-80	-90	-100	-120	-140	-160	-180	-	UKF 2
	V_{Bs}	0...	3	3	3	4	4	5	5	6	7	-	UKF 1
AR (D)	Δ_{ds}	0...	-	-6	-6	-7	-8	-9	-10	-11	-13	-15	
IR (d)	Δ_{ds}	0...	-4	-4	-4	-5	-6	-8	-8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



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)
$n \cdot d_m$		speed factors
d_m		average diameter of bearing $d_m = (d + D)/2$

Nominal d of shaft in mm more than	up to	for grades UKF 1 and 2 tolerance for d	t_1 ⌭	t_2 ↗	t_3 ◎	for grades UKF I, O and HQ tolerance for d $n \cdot d_m$ in rpm · mm ≤ 1,2 · 10^6	> 1,2 · 10^6	t_1 ⌭	t_2 ↗	t_3 ◎	R_a
		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

Kegeliger Wellensitz für AF-Lager



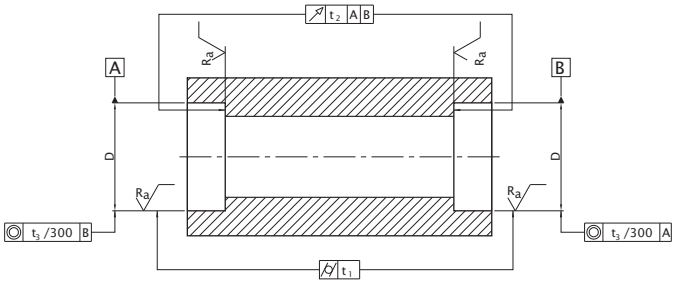
d_1	kleiner Kegeldurchmesser $d_1 \triangleq d$ = Nennmaß der Welle
d_2	großer Kegeldurchmesser $d_2 = d_1 + 0{,}08334 \cdot L$
L	Kegellänge $L = 0{,}95 \cdot B$ (B = Lagerbreite)
AT_D	Kegelwinkeltoleranz als Durchmesserdifferenz senkrecht zur Achse

Nennmaß der Welle d in mm	über	30	40	50	65	80
	bis	30	40	50	65	80	
Abmaß für d_1 in µm		+ 73	+ 91	+ 108	+ 135	+ 159	+ 193
		+ 64	+ 80	+ 97	+ 122	+ 146	+ 178

Nennmaß der Kegellänge L in mm	über	25	40
	bis	25	40	
Kegelwinkeltoleranz AT_D in µm		+ 2,0 / 0	+ 2,5 / 0	+ 3,0 / 0

Form- und Lagetoleranzen sowie Mittenrauhwert wie bei zylindrischen Wellensitzen.

Kegelwinkel 4° 46' 18,8''
Einstellwinkel 2° 23' 9,4''



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					
		tolerance for d		t_1	t_2	t_3	tolerance for d		t_1	t_2	t_3	R_a
more than	up to	fixed bearing	floating bearing	⌭	↗	◎	fixed bearing	floating bearing	⌭	↗	◎	
		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 µm. 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°...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.

Dire assembly errors can usually 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.

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 mm^2/s, combined with a normal working temperature of 40°C, requires a nominal viscosity of 9 mm^2/s.

The nominal viscosity of an oil (in mm^2/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 mm^2 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 for Spindle Bearings, 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, cm^3
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.

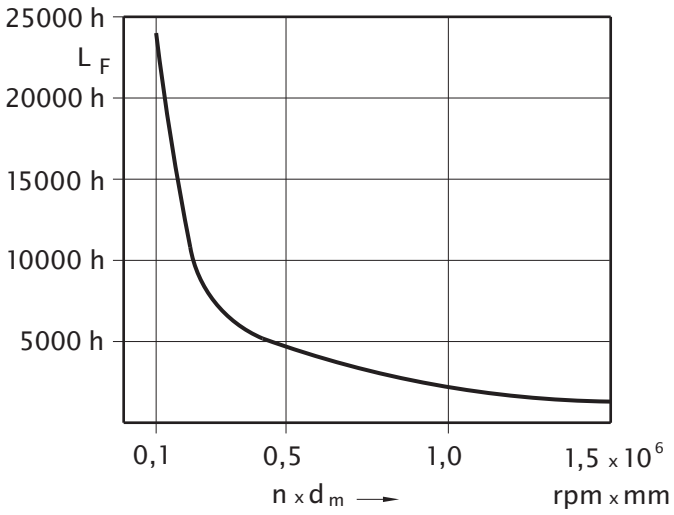
UKF	b_F			
Type Series	d ≤ 20	d=25..45	d=50..100	d > 100
719 UHS/UHC	0,079	0,052	0,043	0,031
70 UHS/UHC	0,085	0,059	0,051	0,046
719 USS(C)/USO(C)	0,049	0,037	0,034	0,030
70 USS (C) USO (C)	0,064	0,048	0,039	0,036
AFSC/AFDC	0,077	0,058	0,047	0,043
K	0,012	0,008	0,007	0,006
UK	0,015	0,011	0,009	-
UL	0,014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

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 · mm.



Lifetime L_G of grease dependent on characteristic value of speed

Relubrication of grease

It is possible to improve the lifetime of the grease with a factor of 2 by using an automatical relubrication system. This micro electrical controlled unit can be connected with an extern CNC. As the result a relubrication of the bearings depending on the lifetime of the machine is possible.

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:

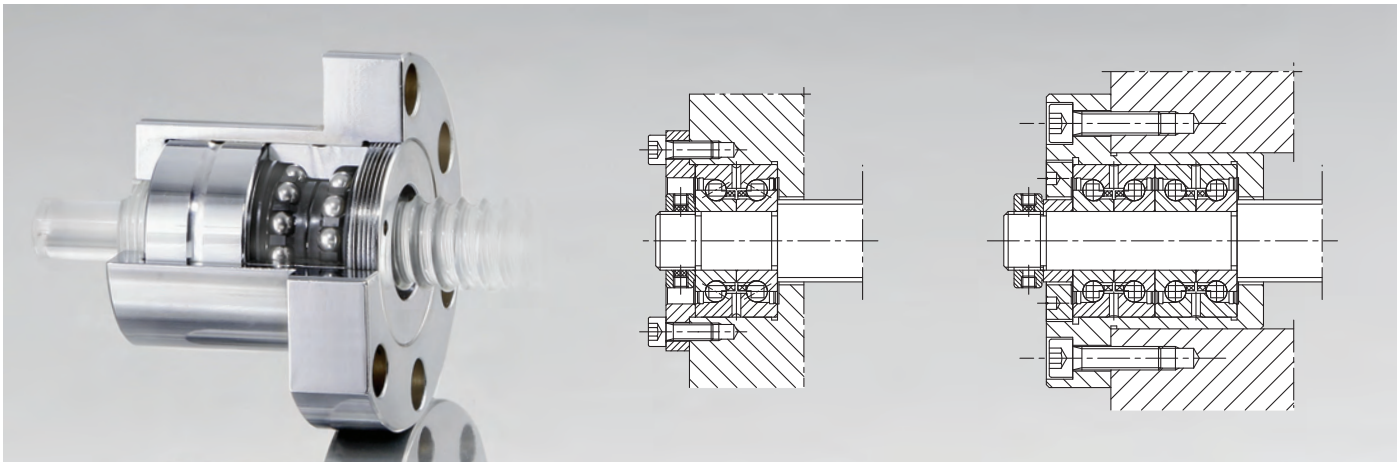
1. rolling friction between the balls and raceways
2. sliding friction between balls and cages - and also between cage and its guidance on the Inner- or Outer Ring (rigid cage!)
3. viscous friction from the lubricant.

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 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, $\alpha = 60°$, 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.

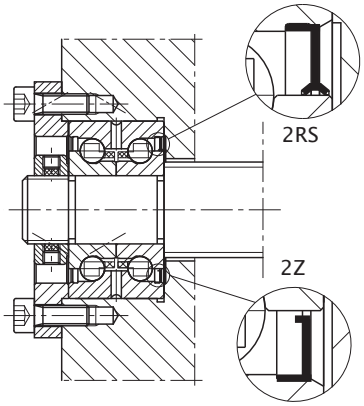
bi-directional loads, installation using bolt-on cover-plate or complete cartridges

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 "2Z" have shields on both sides, with a gap at the rotating Inner Ring. This means less friction, suitable for higher speeds (RPM).

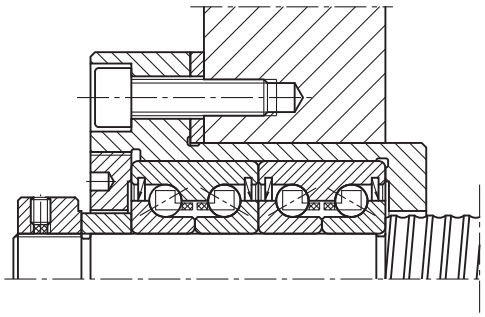


Bearing Cartridges

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

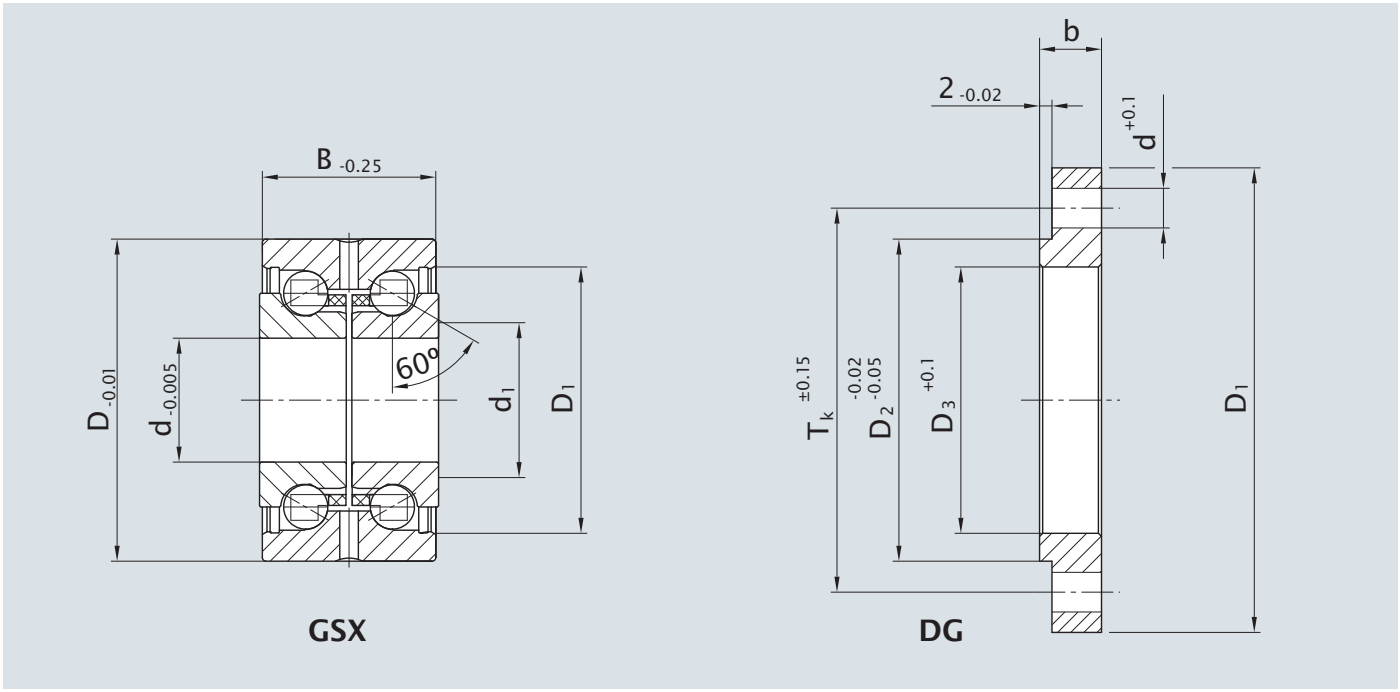
For an even easier installation, and for adjusting the tension of Ball Screws and the support Bearings of double-ended configurations, additional washers, as shown below, can be furnished at extra charge.



Accuracy

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

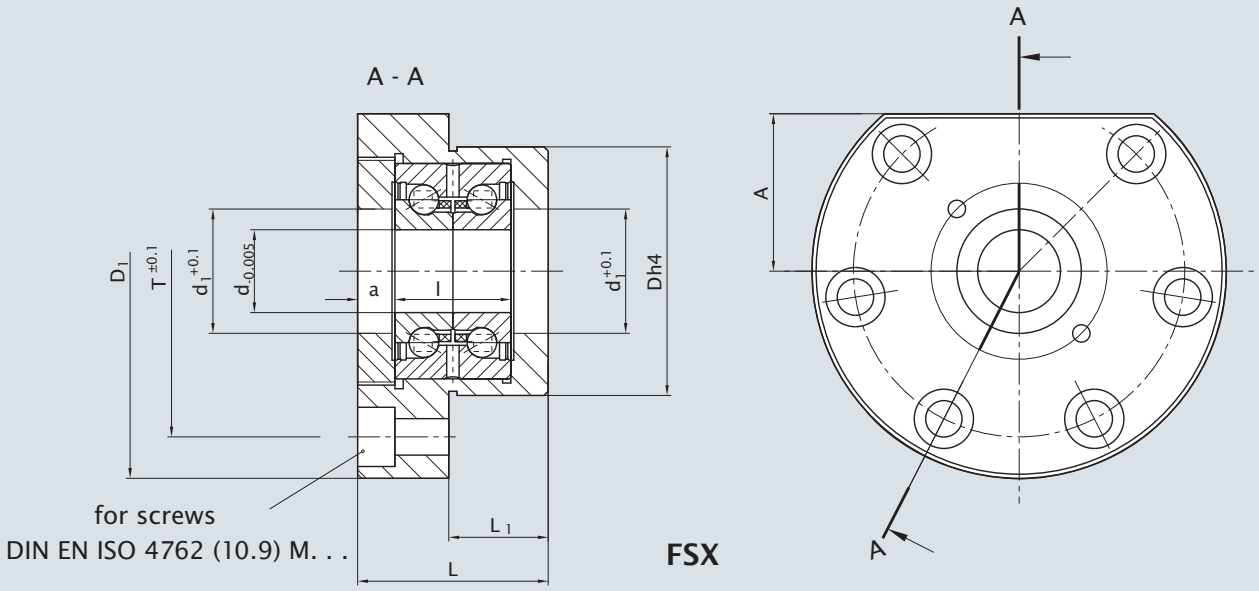
face runout S_d	2,0 µm	at d ≤ 25 mm
	2,5 µm	at d > 25 mm
tolerance I.D.		Δ_{ds} 0... -5 µm
tolerance O.D.		Δ_{Ds} 0... -10 µm
tolerance width		Δ_{Bs} 0... -250 µm



UKF Type	Dimensions			Seat Dimensions		m
	d	D	B	d_1 min.	D_1 max.	kg
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

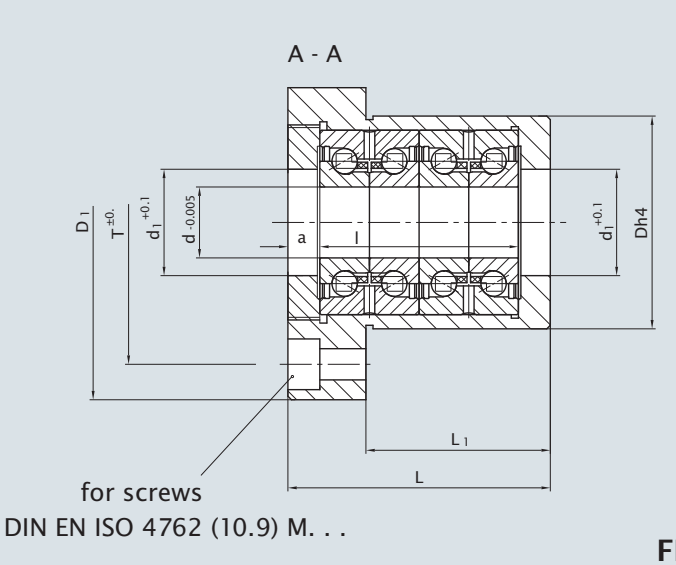
UKF Type						d for screws	
	D_1	D_2	D_3	b	T_k		
DG 12	65	42	33	10	52	M6	3 x 120°
DG 15	70	45	37	10	55	M6	3 x 120°
DG 20	75	52	43	10	62	M6	4 x 90°
DG 25	80	57	48	10	67	M6	4 x 90°
DG 30	85	62	53	10	72	M6	6 x 60°
DG 40	105	75	67	12	89	M8	6 x 60°
DG 50	120	90	80	14	104	M8	8 x 45°

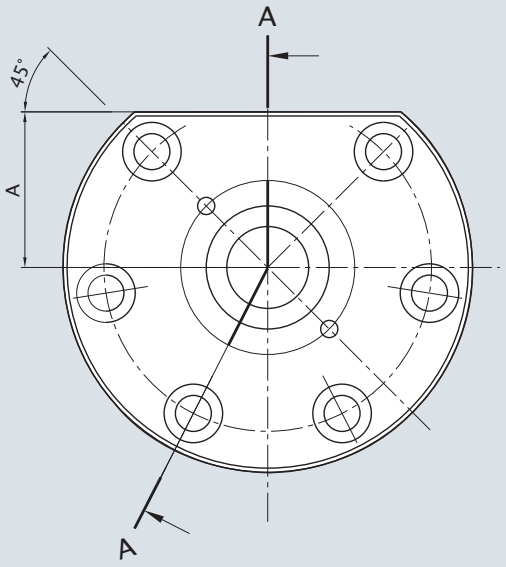
UKF Type	Ratings		Axial Preload	Separating-force	Axial rigidity	Tilting rigidity	Lock Nut		Friction torque		Speed Limit	
	C_0 N	C N	F_v N	F_d N	R_a N/µm	R_K Nm/m rad	Type	Seating torque M_A Nm	M_R Nm 2RS	2Z	n_{lim}rpm 2RS	2Z
GSX 12	24650	16900	960	2200	370	50	NM 12 X	8	0,16	0,08	3800	7600
GSX 15	27900	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



UKF Type	Drilled and Countersunk													
	d	d_1	D	D_1	L	L_1	l	a	A	T	Size	Number	M_{AS} Nm	kg
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	Separating-force	Axial rigidity	Tilting rigidity	Lock Nut		Friction torque		Speed Limit	
	C_0 N	C N	F_v N	F_d N	R_a N/µm	R_K Nm/m rad	Type	Seating torque M_A Nm	M_R Nm 2RS	2Z	n_{lim}rpm 2RS	2Z
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

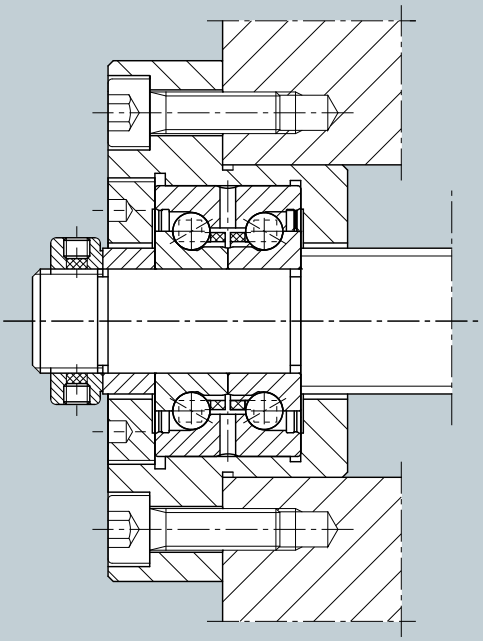




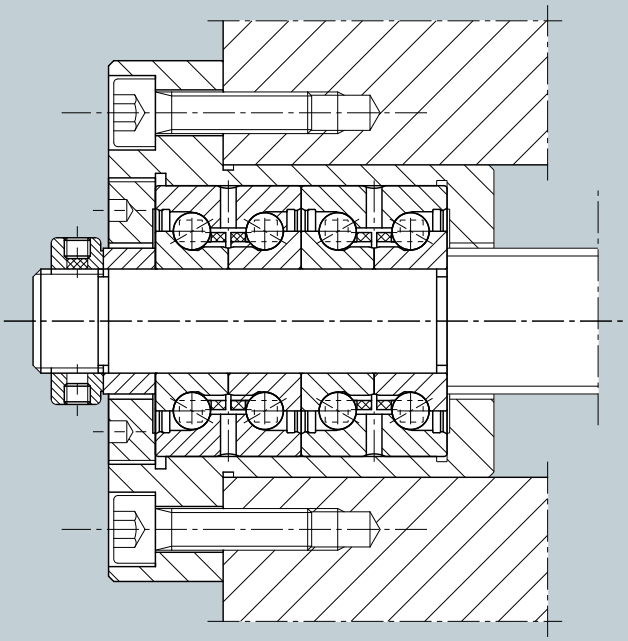
FDX

UKF Type	d	d_1	D	D_1	L	L_1	l	a	A	T	Drilled and Countersunk Size	Drilled and Countersunk Number	M_{AS} Nm	kg
FDX 12	12	20	50	80	65	47	50	8	30	65	M6	6 x 54º	14	1,15
FDX 15	15	25	55	85	66	48	50	8	32	70	M6	7 x 45º	14	1,31
FDX 20	20	30	60	100	74	52	56	9	38	80	M8	6 x 54º	35	1,79
FDX 25	25	37	80	120	77	55	56	11	45	100	M8	6 x 54º	35	3,20
FDX 30	30	43	80	120	77	55	56	11	45	100	M8	7 x 45º	35	3,01
FDX 40	40	51	90	130	92	64	68	12	49	108	M10	7 x 45º	69	4,12
FDX 50	50	64	110	150	92	64	68	12	56	128	M10	8 x 33º 45'	69	5,80

UKF Type	Ratings C_0 N	Ratings C N	Axial Preload F_v N	Separating-force F_d N	Axial rigidity R_a N/µm	Tilting rigidity R_K Nm/m rad	Lock Nut Type	Lock Nut Seating torque M_A Nm	Friction torque M_R Nm 2RS	Friction torque Nm 2Z	Speed Limit n_{lim}rpm 2RS	Speed Limit 2Z
FDX 12	49300	27400	960	4400	615	110	NM 12 X	8	0,25	0,16	3400	6000
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

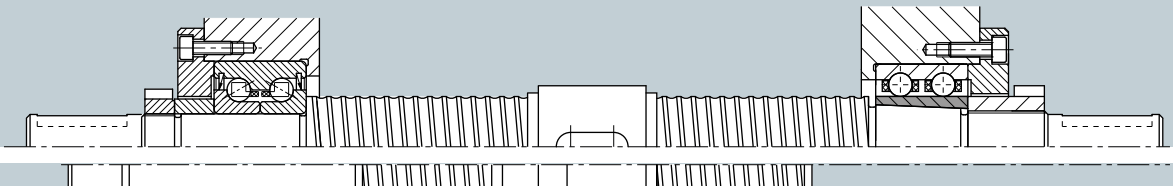


FSX



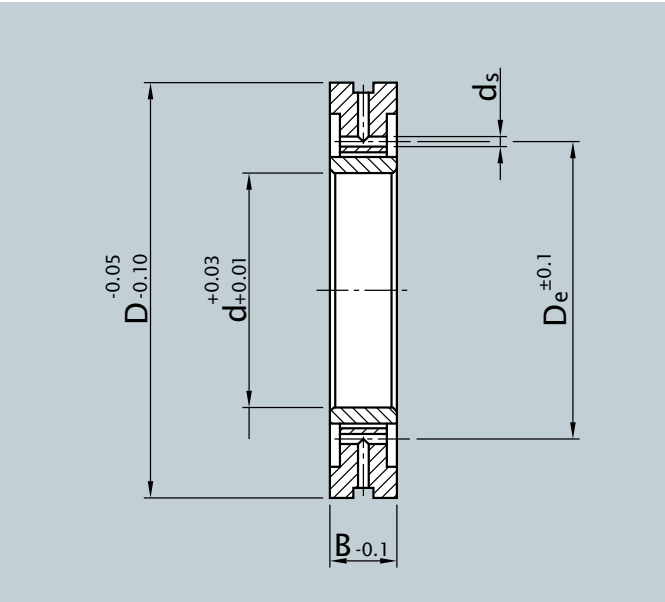
FDX

both ends supported with bearings GSX and AFDC (Floating Bearing)



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

UKF Distance Ring DR



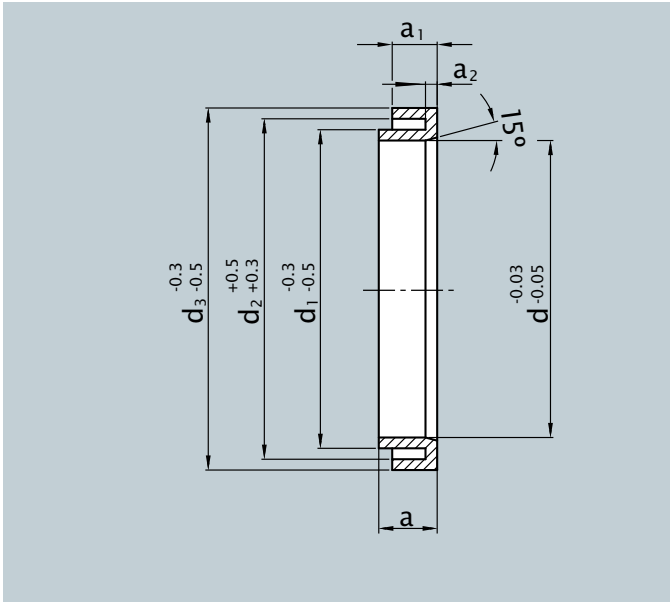
for mounting the bearings with a specified separation, with feed holes for pneumatic oil lubrication or grease reservoir. Compatible with types 719/70 UHS resp. UHC

Dimensions in mm

UKF Type	d	B_{min}*	Series 719 D	D_e	d_s	Series 70 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

*) Specify Bearing Type and required width

UKF Splash Ring SR

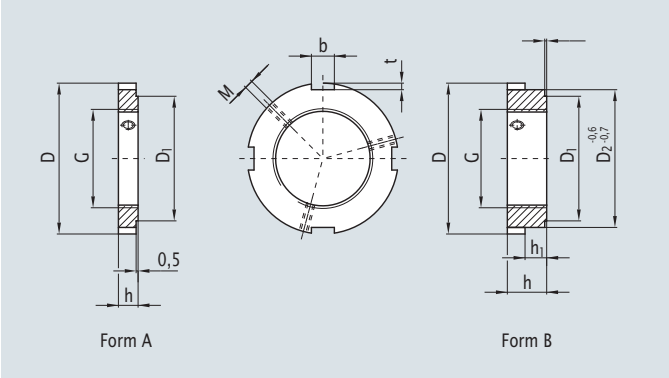


designed for shrink fit onto the shaft; contours match the labyrinth seals of our Bearing Cartridges; heat ring to expand for installation.

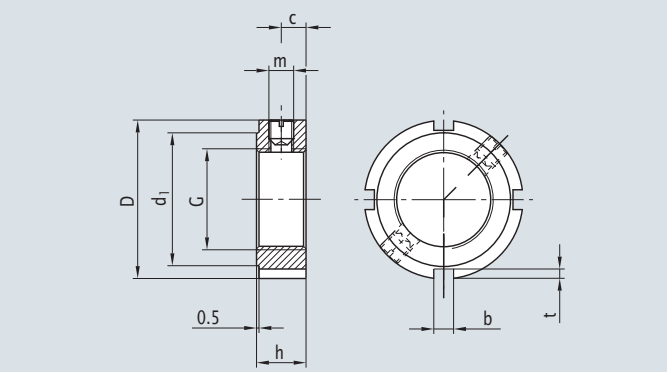
Dimensions in mm

UKF Type	d	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

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 A	h B	h_1	b	t	M
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

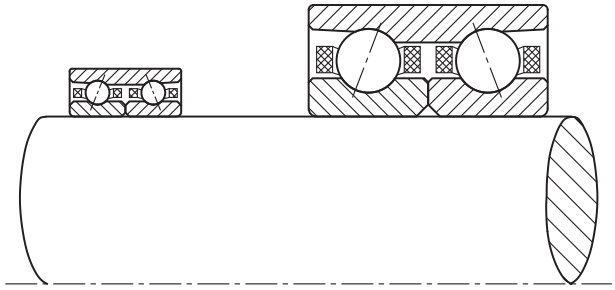
The UKF Range of Products enables us to offer a variety of modifications to complement the Standard Types.

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.

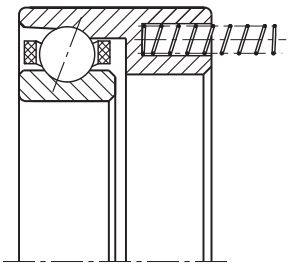
UKF Bearings and Bearing Cartridges can even be manufactured in larger sizes than shown in the tables: up to a **max. O.D. of 380 mm**.

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”.

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)
1,00	500
1,26	1000
1,59	2000
1,82	3000
2,00	4000
2,22	5000
2,29	6000
2,41	7000
2,52	8000
2,62	9000

f_L	L_h (h)
2,71	10000
2,88	12000
3,04	14000
3,17	16000
3,30	18000
3,42	20000
3,68	25000
3,91	30000
4,12	35000
4,31	40000
4,64	50000

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

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 fi is to be taken into consideration.

$C_{group} = f_i \cdot C_{single}$ [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:

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

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.

$C_{group} = 1,62 \cdot C_{USO}$ for precision class UKF I/I and UKF 1/1
$C_{group} = 1,80 \cdot C_{USO}$ 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 (α <20°). For Bearings with a nominal contact angle of $\alpha \geq 20°$, 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 α = 21°)

	$F_a/F_r \leq e$		$F_a/F_r > e$	
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 α = 21°)

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

Series 719 UHS/UHC... - A 15, 70 UHS/UHC...-A15
(contact angle α = 15°)

as a single bearing or in tandem arrangement

$\frac{f_0 \cdot F_a}{i \cdot C_0}$		$F_a/F_r \leq e$		$F_a/F_r > e$	
	e	X	Y	X	Y
0,3	0,40				1,4
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

for paired bearings in O or X arrangement

$\frac{f_0 \cdot F_a}{C_0}$		$F_a/F_r \leq e$		$F_a/F_r > e$	
	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 α = 25°)

as a single bearing or in tandem arrangement

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

for paired bearings in 0 or X arrangement

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

Factor f_o for series 719 UHS/UHC...-A 15, 70 UHS/UHC...-A 15
(contact angle α = 15°)

d	factor f_o	
mm	719 UHS/UHC	70 UHS/UHC
20	15,5	15,2
25	16,0	15,7
30	16,4	15,7
35	16,4	16,0
40	16,5	16,4
45	16,3	16,4
50	16,2	16,5
55	16,3	16,5
60	16,2	16,5
65	16,1	16,4
70	16,1	16,5

d	factor f_o	
mm	719 UHS/UHC	70 UHS/UHC
75	16,1	16,5
80	16,0	16,5
85	16,2	16,4
90	16,1	16,4
100	16,1	16,3
110	16,0	16,4
120	16,0	16,3
130	16,1	16,5
140	16,0	16,4
150	16,1	16,4

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

$\frac{2F_a}{C_0}$	e	$F_a/F_r \le e$		$F_a/F_r \ge e$	
		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 Pm must be calculated, with respect to the respective duration of each individual running condition.

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

preload	f_2
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
	Ø	⊘	1
DT	ØØ	⊘⊘	0,95
DB	Ø⊘	Ø⊘	0,9
TBT	ØØ⊘	Ø⊘	0,75
QBC	ØØ⊘⊘	Ø⊘	0,85
with double row USO bearings (TBT) and QBC combined with USS)			
DB	Ø⊘	Ø⊘	0,9*
TBT	ØØ⊘	Ø⊘	0,85*
QBC	ØØ⊘⊘	Ø⊘	0,8
* with respect to n_{lim} of the USO 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

$f_S = \frac{i \cdot C_o}{P_o}$

f_S = index of static stressing
C_o = static load rating of the single bearing [N]
i = number of bearings
P_o = static equivalent load [N]

Static equivalent load P_o

The static equivalent load is assessed by the equations:

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

The factors X_o and Y_o 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 α = 21°)
$X_o = 0,5$ $Y_o = 0,41$

Series 719 USO, 70 USO, P/LK SO ...2DB, series 719 USS, 70 USS in O- or X arrangement
$X_o = 1$ $Y_o = 0,82$

Series 719 UHS / UHC...-A 15, 70 UHS /UHC ...-A 15
(contact angle α = 15°)

as a single bearing or in tandem arrangement
$X_o = 0,5$ $Y_o = 0,46$

for paired bearings in O or X arrangement
$X_o = 1$ $Y_o = 0,92$

Series 719 UHS /UHC...-A 25, 70 UHS / UHC ...-A 25
(contact angle α = 25°)

as a single bearing or in tandem arrangement
$X_o = 0,5$ $Y_o = 0,38$

for paired bearings in O or X arrangement
$X_o = 1$ $Y_o = 0,76$

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

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

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 d in mm

Preload

L	light
M	medium
S	heavy

alternative:
individual preload as per agreement

Bearing Arrangement

U = Single Bearing, universal
DU = Set of two, universal
Bearing Sets → page 4

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)

Options

2 Z	(or ZZ) shields, with gap to I.R.
LB	lubrication bore through Outer Ring

Additional Special Requirement

marked	radial runout Outer Ring
marked	radial runout Inner Ring
dimensional variation of i.D. and o.D.	

range of tolerance D/d	ΔD_1 upper half
	ΔD_2 lower half
	Δd_1 upper half
	Δd_2 lower half

and:

greased	on request
noise checked	on request

Contact Angles α

A 21 α = 21°	Standard of USS(C), USO(C)
A 15 α = 15°, A 25 α = 25°	A15 Standard of UHS, UHC
A 16 α = 16°	A16 Standard of K, UK, UL, UM
A ...	Custom contact angles 12°...30° as per agreement

Part Number Designation of UKF Bearing Cartridges

LKSS	70.	TBT.	A21.	0/I.	S.	FA/2Z
LKSOC	50.	2DB.	A21.	I/1.	L.	VR
PLKHC	45.	DB.	A15.	HQ/0.	L.	XH/WK
PLKLS	60.	2DF.	A16.	I/1.	M.	VS

Layout

LK	with flange Bearings Series 70
PLK	with collar Bearings Series 719

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

ØØ	DB	2 Spindle Bearings, O-Arrangement
ØØ	DF	2 Spindle Bearings, X-Arrangement
ØØØ	TBT	3 Spindle Bearings
ØØØØ	QBC	4 Spindle Bearings
ØØØØ	2DB	2 Spindle Bearings double row
ØØØØ	2DF	Bearing System LS
ØØØØØ	PBC	5 Spindle Bearings

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

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)

Contact Angles α

A 21 α = 21° Standard of USS(C), USO(C)

A 15 α = 15°, A 25 α = 25°
A 16 α = 16°
A ...

A15 Standard of UHS, UHC
A16 Standard of K, UK, UL, UM
Individual contact angles 12°...30° 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 *)	SKF/SNFA	GMN *)	SKF *)	INA/FAG *)	UKF
					Basic Types
7905...	SEB25...	S 61905...	71905...	B 71905...	719 USS 25 [1]
7905...SN 24	SEB25/NS...	HYS 61905	71905...HC...	HCB 71905...	719 USSC 25 [1]
7905...DB	SEB25...DD	S 61905...DB	71905...DB	B 71905...DB	719 USO 25 [1] [2]
7905...SN24...DB	SEB25/NS...DD	HYS 61905...DB	71905...HC...DB	HCB71905..DB	719 USOC 25 [1] [2]
7005...	EX25...	S 6005...	7005...	B 7005...	70 USS 25 [1]
7005...SN24	EX25/NS...	HYS 6005...	7005...HC	HCB 7005...	70 USSC 25 [1]
7005...DB	EX25...DD	S 6005...DB	7005...DB	B 7005...DB	70 USO 25 [1] [2]
7005...SN24...DB	EX 25/NS...DD	HYS 6005...DB	7005...HC...DB	HCB 7005...DB	70 USOC 25 [1] [2]
---	VEB25...	---	71905 CE...	HS 71905...	719 UHS 25
---	VEB25/NS...	---	71905 CE/HC...	HC 71905...	719 UHC 25
---	VEX25...	---	7005 CE...	HS 7005...	70 UHS 25
---	VEX25/NS...	---	7005 CE/HC	HC 7005...	70 UHC 25
---	---	---	---	FD 1005...	70 AFSC 25
---	---	---	---	---	70 AFDC 25
					additional markings:
C	...1	C	CD or CE	C	A 15
A5	...3	E	ACD	E	A 25
V1V	---	KH...	---	2RSD	2Z
---	..../H1	---	---	DLR	LB
---	..../XN	---	---	X....	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 ...

[1] Angle of contact at an optimum $\alpha = 21°$ (on request 12°...30°) [2] Double row Bearing in O-arrangement DB

*) for inner diameter d:
...00 = ∅ 10 mm ...03 = ∅ 17 mm
...01 = ∅ 12 mm ...04 = ∅ 20 mm
...02 = ∅ 15 mm ...05 = ∅ 25 mm etc.

Comparison of Ball Screw Support Bearings

	ZKLN	GSX
	...	FSX
	...	FDX

Measurement Units

Inch	mm
0,00001 (1/4 µm)	0,00025
0,0001	0,0025
0,0002	0,005
0,0003	0,0075
0,0004	0,010
0,0005	0,013
0,0007	0,018

Inch	mm
0,001	0,025
0,003	0,075
0,004	0,100
0,005	0,1125
0,007	0,18
0,010	0,25
0,015	0,40
0,020	0,50
1/32	0,75
1/16	1,5
1,0	25,4

°C	°F
0°	32°
50°	122°
100°	212°

kp	lb
0,454	1
1,0	2,203

N	kp
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

Certified and audited No. 07-24024995
TÜV Munich/RKW Berlin

UKF delivers

ex works Berlin, overnight by air
or ex stock from our distributors
abroad in Europe, overseas, Far East.

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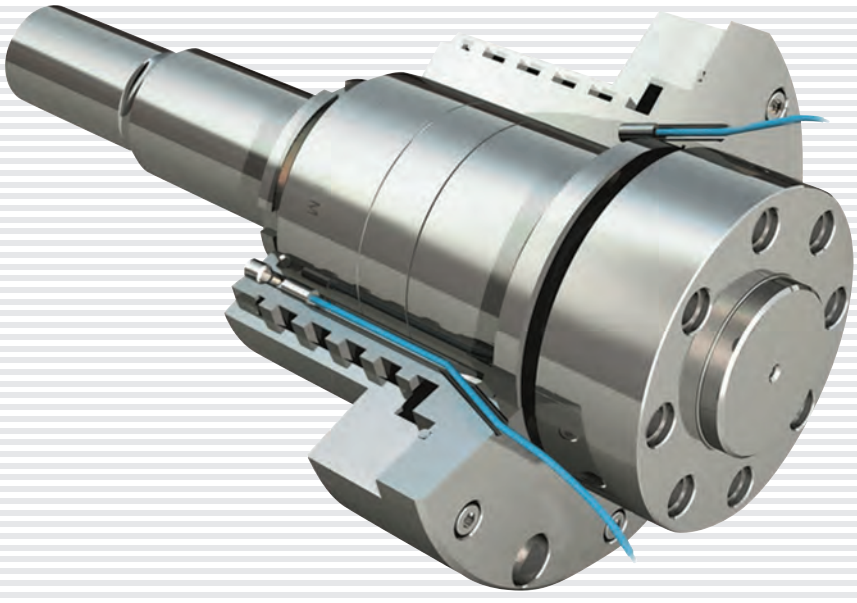

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