MONTON

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MONTON

洛阳盟拓轴承科技有限公司

LUOYANG MONTON BEARING SCIENCE & TECHNOLOGY CO.,LTD.

Company profile

盟拓轴承成立于2001年，坐落于“千年古都、牡丹花城”洛阳，我们专注轴承领域20多年，专注于“高新科技、精密、先进、非标”轴承的研发,是一家高新技术企业。公司占地面积35000平方米，建筑面积20000平方米，其中办公区域占地面积3000平米，研发中心占地面积500平米，国际营销会议接待中心 2000平方米。盟拓轴承的使命是一直并将继续为客户提供完整的集成解决方案，其中包括设计与开发制造测试与评估以及完善的售后服务。工厂位于河南省洛阳市宜阳县产业集聚区轴承产业园。

MONTON bearing a main manufacturers leader of high precision bearings in China was established in 2001 locate in Luoyang--“Ancient Imperial Capital and Peony Flower City”,we specialized in the bearing production research and development more than 20 years , focus on the development of "High-tech, High precision, Advancing, customized" bearings development .MONTON covers an area of of 35000 sq.m., building area of 20000 sq.m., including office area 3000 sq.m., research and development center of 500 sq.m., and international marketing & reception center 2000sq.m.Our mission is to provide customers with complete solution, including design and development, manufacturing, testing and evaluation, and excellent after-sales service.The factory is located in the Bearing Industry Park of Yiyang County, Luoyang City, Henan Province.

盟拓轴承主要生产角接触球轴承、丝杠轴承、超低温轴承、高速电机轴承、特种精密轴承、交叉滚子轴承、谐波减速机轴承、推力轴承组、TC向心轴承、等截面薄壁轴承、串列推力圆柱滚子轴承、非标定制轴承及轴承组件。产品精度可达到P5/P4/P2级；滚动体产品可生产 ϕ 1mm至160mm，精度等级为Ⅰ、Ⅱ级。为河南科技大学、大连理工、哈尔工大、北京科技、北京交通、中国石油等多所知名院校的重要科研项目做出突出贡献。

MONTON bearing mainly produce high precision angular contact ball bearing, ball screw support bearing,Low temperature bearing,High speed motor bearings, military thin section ball bearing,special high precision bearing, crossed roller bearing,harmonic drive bearing,thrust bearing stack,Tungsten Carbide Radial Bearing, military thin section ball bearing,tandem bearing,cylindrical roller bearing, customized bearing and bearings parts, The bearing accuracy at P5/P4/P2 level, rolling elements from ϕ 1mm to 160mm, precision degree Ⅰ、Ⅱ,We Contributions to important scientific research projects of several well-known universities, including Henan University of Science and Technology, Dalian University of Technology, Harbin Institute of Technology, Beijing University of Science and Technology, Beijing traffic University, and China Petroleum etc.

我们生产内径1.5mm至外径3m的轴承和部件。我们的产品已广泛应用于数控机床、高速主轴、精密仪器、石油钻井、石油化工、低温泵、高速电机、矿山冶金、港口机械、医疗器械、齿轮箱、水泥、纺织、造纸机械、混凝土搅拌车、钢厂连铸轧机、风力发电、工业机器人、谐波减速机、无人机、摄像头、航空航天等重要工业领域。

We produce bearings and parts with inner diameter of 1.5mm to an outer diameter of 3000mm. Our products have been widely used in important industrial fields such as CNC machine tools, high-speed spindles, precision measurement instruments, oil drilling, petrochemicals,Cryogenic pump, FANUC/Siemens motors, mining metallurgy, port machinery, medical equipment, extruder gearbox, Cement roller press, vertical mill, rocker arm, textiles equipment, paper mill,robotics, harmonic drive, concrete mixer trucks, steel mills, rolling mills,Wind Power,Continuous casting mill, UAV, Air Compressor,Tension levelers,LIDAR systems,missile tracking camera ,aerospace, etc.

我司拥有良好的生产保障条件，关键生产设备及检测仪器均为国外进口设备或公司自主改造的专用设备；主要检测仪器采用日本ACCRETECH、泰勒，德国Zeiss等进口品牌；建有精密轴承产品试验室，能够开展产品性能及寿命试验;通过ISO9001质量体系认证；具备年产各类精密轴承100万套的生产能力。

Our company have very good products quality guarantee equipment, key equipment and instrumentation are imported or design special equipment for special procedure by us. Main instrumentation is Japan ACCRETECH, TAYLOR,ZEISS Germany etc. Established precision bearing product testing laboratory, we can test bearing performance and life,Passed ISO9001 quality system certification, with an annual production capacity of 1 million sets of various precision bearings.

公司拥有各种数控车床、加工中心、数控磨床、超精设备160余台。数控车床10台，数控精密磨床65台，4轴加工中心一台。超声波清洗线和输送带2条，回火稳定炉2台，热处理炉1台，低温稳定设备1台，真空设备1台，自动装配线8条。检测设备有日本三丰轮廓仪,圆度仪,硬度仪,三坐标,测长仪,振动测量仪,接触角测量仪,凸出量测量仪,硬度计,金相测量仪,游隙测量仪,高度测量仪,内外径以及旋转精度测量仪等.

MONTON owns CNC lathes, machining centers, CNC grinding machines, and ultra precision equipment more than 160 sets. 10 CNC lathes, 65 CNC precision grinding machines, and 1set 4-axis machining center. 2 sets Ultrasonic cleaning line and equipment,2 sets tempering and stabilizing furnaces,1set heat treatment furnace, 1sets low temperature stabilization equipment and vacuum equipment,8 production lines of automatic assembly.Inspection equipment include Mitotoyo Japan Contour,roundness measuring instrument,hardness tester,coordinate measuring instrument, length measuring instrument,vibration measuring instrument,contact angle goniometer,Bearing convexity value measuring instrument,hardness tester,Metallographic tissue measuring instrument,Clearance measuring instrument,height measuring instrument,Inner diameter outer diameter and rotation accuracy measuring instrument etc.

公司现有员工140余名，其中，技术人员10人，检验人员25人。现有硕士学位以上人员5名，本科学历25名，专科学历人员30名。

We have more than 140 employees, including 10 technical persons and 25 inspection persons. There are 5 persons with a master's degree, 25 persons with bachelor's degree, and 30 with vocational degree currently .

凭借先进的生产设备和完善的检测技术，确保所生产产品的质量和精度。我们的技术部门可以根据客户的需求快速完成新产品的设计，如需要非标轴承的客户也可以根据需求进行定制。我们的质量体系定期监控各种生产设施并遵守严格的质量要求，产品材料证书和认证报告都保存在文件中，产品具有可追溯性，可应要求提供。因此，我们有信心为全球客户提供配套的解决方案。我公司可为客户设计非标准轴承与特种用途的轴承，及来样定制产品！

With advanced production equipment and perfect testing technology, MONTON can guarantee the quality and accuracy of the products we produced. Our technical department can efficiently complete the bearing design according to customer needs, and customers who need non-standard bearings can also enjoy customized services. Our quality system regularly monitors various production facilities and complies with strict quality requirements. All material certificates and certification reports are kept in files. Products are traceable and can be provided on request. Therefore, we are confident to provide the best solutions for global customers. Our company can design non-standard bearings and special application bearings for customer, as well as customized products with samples!

我们具有创新精神，有动力和勇气为我们的客户提供必要的解决方案，我们的管理层和员工随时准备提供专业和为我们的客户提供个性化服务。盟拓未来将坚持品牌发展战略，加强高端产品的研发，努力打造数字化工厂，携手更多的合作伙伴，同心经营，共创美好未来！

We are innovative, motivated and courageous to provide our customers with necessary solutions. Our management and employees are always ready to provide professional and personalized services to our customers. In the future, MONTON will adhere to the brand development strategy, strengthen the research and development of high-end products, strive to build a digital factory, and join hands with more partners to work together for a better future!

公司精神：诚实、守信、互惠、互利；
公司方针：质量为本；
公司经营理念：诚信、守诺；
公司宗旨：为客户解决问题，优先服务客户！
热诚欢迎各界朋友前来参观、考察、洽谈业务。

Company spirit: Honesty, Trustworthiness and Mutual benefit;
Company policy: Quality-oriented;
Company Business philosophy: Honesty,fulfill promise;
Company principle: Solve problems for customers and prioritize customer service at first.
We warmly welcome all friends come to visit us, study or business negotiation.

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Contents 目录

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精密角接触球轴承

Precision Angular Contact Ball Bearings

● Bearing Code

B 70 08-C -T-P4S-UL
HSS 70 08-C -T-P4S-UL
HCB 70 08-C DLR -T-P4S-UL
B 70 08-C -2RSD -T-P4S-UL
B 70 08-C -T-P4S-UL

Bearing Type

B	Standard Steel balls
HCB	Hybrid Standard Ceramic balls
HS	High Speed Bearings Steel balls
HSS	High Speed Bearings Steel balls, sealed
HC	High Speed Bearings Ceramic balls
HCS	High Speed Bearings Ceramic balls, sealed

BNR, BER: High-Speed Angular Contact Ball Bearings

Dimension Series

718	Ultra-light series
719	Light series
70	Medium series
72	Heavy series

Bore Reference Number

6	6mm
7	7mm
8	8mm
9	9mm
00	10mm
01	12mm
02	15mm
03	17mm
04	4·5=20mm
05	5·5=25mm

Contact Angle

C	15°
E	25°

External Form

	DIRECT LUBE	
-CDLR	Direct radial lubrication holes with integral O rings	15°
-EDLR	Integral O-ring	25°

Seal

-2RSD	Sealed at both sides and lubricated Sealed designs are indicated with a point (•) in the bearing tables

Preload

L	Light
M	Medium
H	Heavy

Bearing Arrangement

U	(SU) universal Single bearing
DU	Set of 2 universal bearings
TU	Set of 3 universal bearings
QU	Set of 4 universal bearings
PU	Set of 5 universal bearings
DB	Set of 2 bearings O arrangement
DF	Set of 2 bearings X arrangement
DT	Set of 2 bearings Tandem arrangement
TBT	(DBD,DFDDTD,DUD)Set of 3 bearings Tandem – O – arrangement
QBC	(DBB,DFF,DBT,DFT , DTT,QU)Set of 4 bearings Tandem – O – Tandem arrangem.

Accuracy

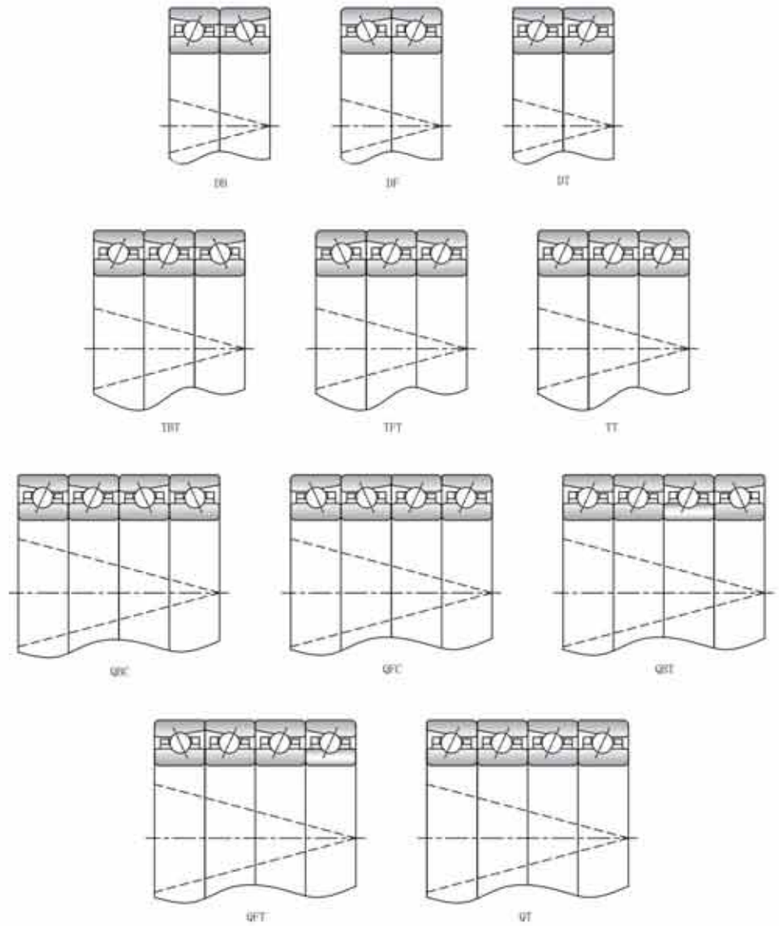
P2	ISO Class 2
P4	ISO Class 4
P5	ISO Class 5

Cage

T	Textile laminated phenolic resin, outer ring guided
TX	Textile laminated phenolic resin, outer ring guided
TPA	Textile laminated phenolic resin, series B718 outer ring guided

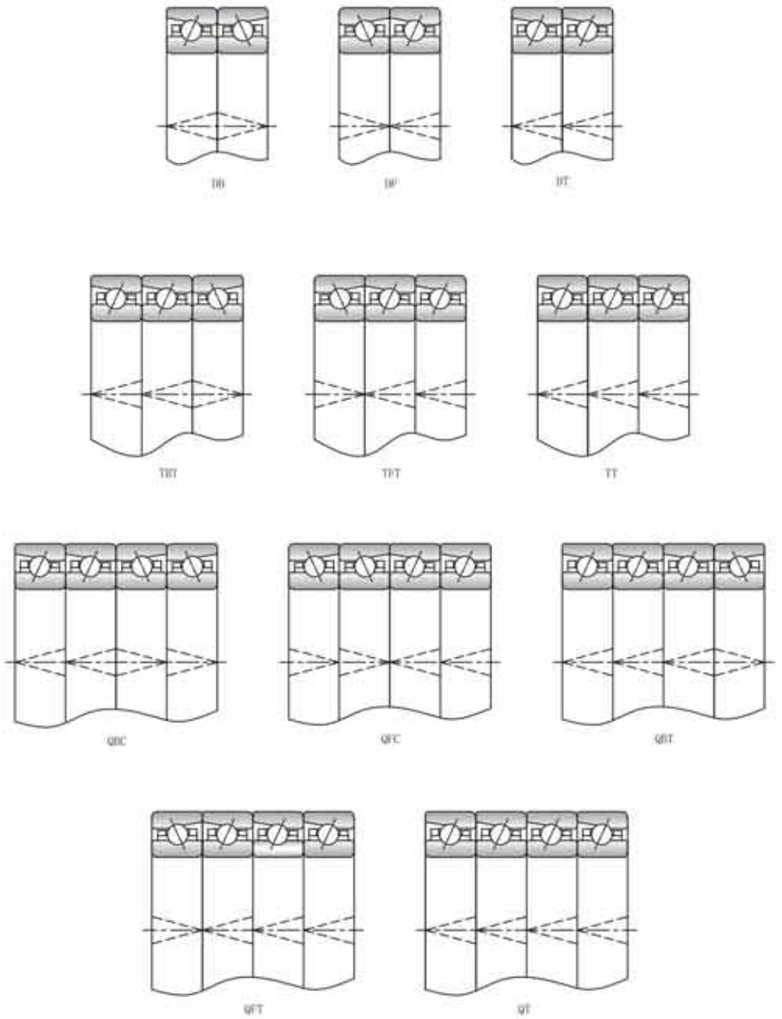
●Angular contact ball bearings arrangement

Angular contact ball bearings can be configured according to different loads. Ex.: DB back-to-back, DF face-to-face and DT Tandem arrangement, also can arrange triple or quarter combine types, arrangement as the picture shows. Tandem type, ex. DT TT&QT, only withstand single direction axial load. The above combined configuration is not interchangeable, Therefore, after the combination, there is marks < on bearings outer ring surface. The user must not change the position of the bearing by willing. In order to improve the accuracy of bearing installation, The inner ring run out K_{ia}, outer Rings run out K_{ea}, max point mark on inner & outer rings. For the user to install the bearing, the inside and outside diameter of the bearing and the matched shaft and the seat hole are properly configured, so that the spindle can obtain the best geometric precision and rotation accuracy. There is suffix after the arrangement, A B or C , A: light preload, B: Medium load, C: heavy load.



轴承组配方式 Bearing arrangement

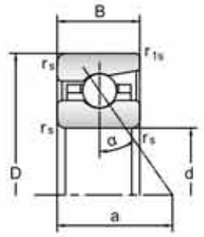
MONTON can provided universal types according to user's requirements. It's can interchangeable, users can configure various arrangement according to their needs, universal code U, and after U, follow the preload code, A B or C. Universal arrangement, each bearings with mark < on outer ring.Below shows DB DF DT arrangement ect. with marks, others, similar as below. About the arrangement technical, refer to: Technical requirements for angular contact ball bearings assembly GB/T 32334-2015.



受力方向 Forced Direction

MONTON provide costumed preload according to customer request, and different arrangement bearings.

微型精密角接触球轴承
Micro Precision Angular Contact Ball Bearings



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings		极限转速 Attainalbe Spped		重量 Weight
	d	D	B	ramin	r1min	Cr	Cor	脂Lub.	油Oil	≈
	mm					kN		r/min		Kg
708C	8	22	7	0.30	0.15	3	1.6	70000	110000	0.01
708AC	8	22	7	0.30	0.15	2.8	1.5	63000	95000	0.01
7000C	10	26	8	0.30	0.15	4	2.4	67000	400000	0.02
7000AC	10	26	8	0.30	0.15	3.8	2.3	60000	90000	0.02
7001C	12	28	8	0.30	0.15	5	3.0	60000	90000	0.02
7001AC	12	28	8	0.30	0.15	4.8	2.8	56000	85000	0.02
7002C	15	32	9	0.30	0.15	5.3	3.3	50000	75000	0.03
7002AC	15	32	9	0.30	0.15	5.1	3.1	45000	67000	0.03
7003C	17	35	10	0.30	0.15	6.7	4.9	45000	67000	0.04
7003AC	17	35	10	0.30	0.15	6.4	4.7	40000	60000	0.04
728 C	8	24	8	0.30	0.15	4.5	2.3	67000	100000	0.02
728 AC	8	24	8	0.30	0.15	4.5	2.2	60000	90000	0.02
7200 C	10	30	9	0.60	0.15	6.5	3.8	56000	85000	0.03
7200 AC	10	30	9	0.60	0.15	6.3	3.7	53000	80000	0.03
7201 C	12	32	10	0.60	0.15	7.2	4.5	53000	80000	0.04
7201 AC	12	32	10	0.60	0.15	6.9	4.3	48000	70000	0.04
7202 C	15	35	11	0.60	0.15	9.1	5.8	48000	70000	0.05
7202 AC	15	35	11	0.60	0.15	8.8	5.6	43000	63000	0.05
7203 C	17	40	12	0.60	0.30	11.3	7.4	40000	60000	0.07

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

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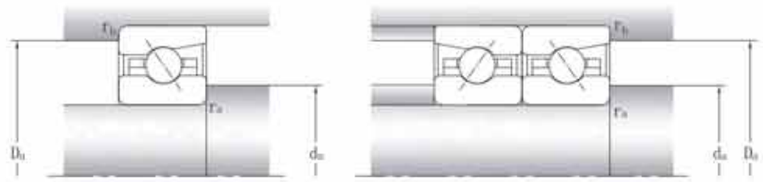

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings		极限转速 Attainalbe Spped		重量 Weight
	d	D	B	ramin	r1min	Cr	Cor	脂Lub.	油Oil	≈
	mm					kN		r/min		Kg
723C	3	10	4			650	240	95000	100000	0.0016
719/4C	4	11	4			720	290	93000	98000	0.0018
724C	4	13	5			1330	510	88000	93000	0.0032
719/5C	5	13	5			1090	440	85000	90000	0.0024
705C	5	14	5			1550	520	83000	88000	0.0035
725C	5	16	5			1770	690	80000	85000	0.0048
719/6C	6	15	5			1360	540	80000	85000	0.0038
706C	6	17	6			2030	770	75000	80000	0.006
726C	6	19	6			2770	1260	80000	110000	0.0081
719/7C	7	17	5			1620	720	70000	75000	0.0052
707C	7	19	6			2400	1020	68000	73000	0.0079
727C	7	22	7			3360	1400	67000	71000	0.013
719/8C	8	19	6			2000	870	64000	68000	0.0073
708C	8	22	7			3360	1400	62000	66000	0.012
728C	8	24	8			4100	1600	59000	63000	0.017
709C	9	24	7			3900	1500	58000	62000	0.015
729C	9	26	8			4900	2100	56000	60000	0.02

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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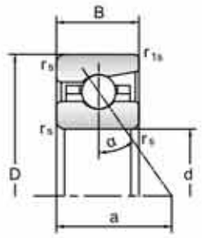
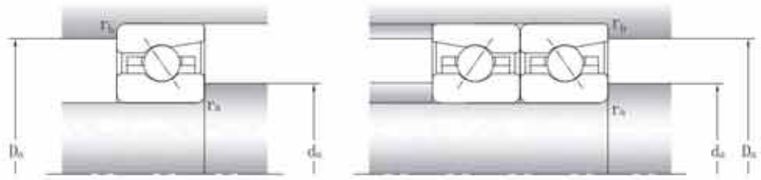
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
7000C Series α=15°
7000AC Series α=25°





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					安装尺寸Abutment Dimensions				额定载荷 Loading ratings	
	d	D	B	ramin	r1min	da	Da/Db	ra	rb	Cr	Cor
	mm					min	max	max	max	kN	
7004C	20	42	12	0.6	0.15	24.5	37.5	0.6	0.15	9.6	6.3
7004AC	20	42	12	0.6	0.15	24.5	37.5	0.6	0.15	9.2	6
7005C	25	47	12	0.6	0.15	29	43	0.6	0.15	12.9	8.7
7005AC	25	47	12	0.6	0.15	29	43	0.6	0.15	12.3	8.3
7006C	30	55	13	1.0	0.3	34.5	50.5	1.0	0.3	15.7	11.6
7006AC	30	55	13	1.0	0.3	34.5	50.5	1.0	0.3	14.9	10.9
7007C	35	62	14	1.0	0.3	40.5	56.5	1.0	0.3	19.3	17.5
7007AC	35	62	14	1.0	0.3	40.5	56.5	1.0	0.3	18.3	16.6
7008C	40	68	15	1.0	0.3	46	62	1.0	0.3	19.9	19.1
7008AC	40	68	15	1.0	0.3	46	62	1.0	0.3	18.9	18.2
7009C	45	75	16	1.0	0.3	50.5	69.5	1.0	0.3	26.7	25.3
7009AC	45	75	16	1.0	0.3	50.5	69.5	1.0	0.3	25.4	24.1
7010C	50	80	16	1.0	0.3	55.5	74.5	1.0	0.3	27.6	27.5
7010AC	50	80	16	1.0	0.3	55.5	74.5	1.0	0.3	26.2	26.2
7011C	55	90	18	1.1	0.6	61.5	83.5	1.1	0.6	36.7	37.1
7011AC	55	90	18	1.1	0.6	61.5	83.5	1.1	0.6	34.8	35.3
7012C	60	95	18	1.1	0.6	66.5	88.5	1.1	0.6	37.8	40
7012AC	60	95	18	1.1	0.6	66.5	88.5	1.1	0.6	35.8	38
7013C	65	100	18	1.1	0.6	71.5	93.5	1.1	0.6	38.9	42.9
7013AC	65	100	18	1.1	0.6	71.5	93.5	1.1	0.6	36.8	40.7
7014C	70	110	20	1.1	0.6	77.5	103	1.1	0.6	49.9	55.5
7014AC	70	110	20	1.1	0.6	77.5	103	1.1	0.6	47.2	52.7
7015C	75	115	20	1.1	0.6	82.5	108	1.1	0.6	51.3	59.2
7015AC	75	115	20	1.1	0.6	82.5	108	1.1	0.6	48.5	56.2
7016C	80	125	22	1.1	0.6	88	117	1.1	0.6	61.6	70.4
7016AC	80	125	22	1.1	0.6	88	117	1.1	0.6	58.3	66.9
7017C	85	130	22	1.1	0.6	93	122	1.1	0.6	63.3	75
7017AC	85	130	22	1.1	0.6	93	122	1.1	0.6	59.9	71.3

极限转速 Attainalbe Spped								重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	A(轻)	B(中)	C(重)	≈
r/min		N			N/μm			Kg
38000	56000	50	150	300	24	35	44	0.06
34000	50000	80	240	480	64	90	113	0.06
34000	50000	65	190	380	29	42	53	0.07
30000	45000	105	310	620	77	108	136	0.07
28000	43000	80	240	480	35	50	63	0.11
24000	38000	130	390	780	92	128	161	0.11
20000	34000	100	300	600	39	56	71	0.15
19000	32000	165	490	980	104	146	183	0.15
19000	32000	105	310	620	41	59	75	0.19
17000	28000	170	510	1020	109	153	193	0.19
17000	28000	140	420	840	46	67	85	0.23
16000	26000	320	690	1380	123	172	216	0.23
16000	26000	145	430	860	49	71	89	0.25
15000	24000	235	700	1400	130	182	229	0.25
14000	22000	195	580	1160	56	81	103	0.37
13000	20000	315	940	1880	150	210	264	0.37
14000	20000	500	600	1200	59	85	108	0.39
12000	19000	325	970	1940	158	221	278	0.39
13000	20000	210	630	1260	62	90	114	0.42
11000	18000	330	990	1900	165	232	292	0.42
12000	19000	270	810	1620	70	102	129	0.59
10000	17000	425	1270	2540	188	263	331	0.59
11000	18000	248	820	1640	74	106	135	0.62
9500	16000	435	1300	2600	197	276	346	0.62
10000	17000	330	990	1980	78	113	144	0.83
9000	15000	525	1570	3140	209	294	369	0.83
9500	16000	340	1000	2000	82	119	150	0.87
8500	14000	540	1620	3240	219	307	386	0.87

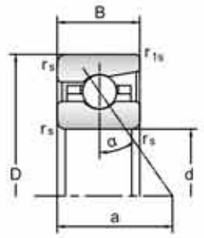
注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

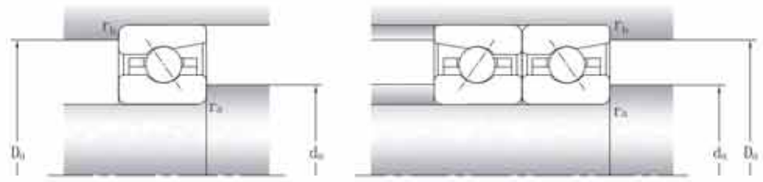
MONTON

高速精密角接触球轴承
Precision Angular Contact Ball Bearings

7000C Series α=15°

7000AC Series α=25°





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					安装尺寸Abutment Dimensions				额定载荷 Loading ratings	
	d	D	B	ramin	r1min	da	Da/Db	ra	rb	Cr	Cor
	mm					min	max	max	max	kN	
7018C	90	140	24	1.5	0.6	100.5	130	1.5	0.6	66.9	84
7018AC	90	140	24	1.5	0.6	100.5	130	1.5	0.6	63.2	79.7
7019C	95	145	24	1.5	0.6	104	136	1.5	0.6	79.1	97.6
7019AC	95	145	24	1.5	0.6	104	136	1.5	0.6	74.8	92.7
7020C	100	150	24	1.5	0.6	109	141	1.5	0.6	81.2	103.3
7020AC	100	150	24	1.5	0.6	109	141	1.5	0.6	76.7	98
7021C	105	160	26	2.0	1.0	115	150	2.0	1.0	93.9	118.2
7021AC	105	160	26	2.0	1.0	115	150	2.0	1.0	88.8	112.2
7022C	110	170	28	2.0	1.0	121	159	2.0	1.0	110.4	139.8
7022AC	110	170	28	2.0	1.0	121	159	2.0	1.0	104.4	132.8
7024C	120	180	28	2.0	1.0	131	169	2.0	1.0	112.7	148.7
7024AC	120	180	28	2.0	1.0	131	169	2.0	1.0	106.5	141.1
7026C	130	200	33	20.	1.0	142.5	187.5	2.0	1.0	144.8	190.8
7026AC	130	200	33	2.0	1.0	142.5	187.5	2.0	1.0	136.8	181
7028C	140	210	33	2.0	1.0	152.5	197.5	2.0	1.0	148.7	202.6
7028AC	140	210	33	2.0	1.0	152.5	197.5	2.0	1.0	140.4	192.2
7030C	150	225	35	2.1	1.1	163.5	211.5	2.1	1.1	168.4	232.5
7030AC	150	225	35	2.1	1.1	163.5	211.5	2.1	1.1	159.1	220.6
7032C	160	240	38	2.1	1.1	174.5	225.5	2.1	1.1	189.1	264.5
7032AC	160	240	38	2.1	1.1	174.5	225.5	2.1	1.1	178.6	251
7034C	170	260	42	2.1	1.1	188	242	2.1	1.1	205.6	299.3
7034AC	170	260	42	2.1	1.1	188	242	2.1	1.1	194.2	284
7036C	180	280	46	2.1	1.1	201.5	259	2.1	1.1	229.5	352.1
7036AC	180	280	46	2.1	1.1	201.5	259	2.1	1.1	216.8	334.1
7038C	190	290	46	2.1	1.1	211.5	269	2.1	1.1	235.1	370.8
7038AC	190	290	46	2.1	1.1	211.5	269	2.1	1.1	222.1	351.8
7040C	200	310	51	2.1	1.1	220	290	2.1	1.1	289.1	471.4
7040AC	200	310	51	2.1	1.1	220	290	2.1	1.1	273.1	447.3

极限转速 Attainalbe Spped		预载荷 Preloading Force			轴向刚度 Axial Rigidity			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	A(轻)	B(中)	C(重)	≈
r/min		N			N/μm			Kg
9000	15000	360	1050	2100	89	129	163	1.18
8000	13000	570	1710	3420	239	335	421	1.18
8500	14000	420	1250	2500	94	137	173	1.2
7500	12000	670	2010	4020	253	354	446	1.2
8000	13000	430	1290	2580	98	142	180	1.25
7000	11000	690	2070	4140	263	370	464	1.25
7500	12000	500	1500	3000	103	149	189	1.58
7000	11000	800	2400	4800	276	387	487	1.58
7000	11000	590	1750	3500	112	162	205	1.97
6700	10000	950	2850	5700	299	421	592	1.97
7000	11000	600	1800	3600	116	169	213	2.11
6700	10000	970	2910	5820	312	438	550	2.11
6700	10000	750	2200	4400	129	187	236	3.18
6000	9000	1200	3600	7200	346	485	610	3.18
6000	9000	800	2400	4800	134	194	264	3.37
5600	8500	1300	3900	7800	350	505	625	3.37
5600	8500	900	2700	5400	143	207	262	4.1
5000	7500	1400	4200	8400	384	539	677	4.1
5000	7500	1000	3000	6000	151	220	278	5.07
4800	7000	1600	4800	9600	4077	572	719	5.07
4800	7000	1100	3300	6600	158	230	291	6.9
4300	6300	1750	5200	10000	427	600	754	6.9
4500	6700	1200	3600	7200	172	250	317	9.21
4000	6000	1950	5800	11500	465	653	821	9.21
4300	6300	1300	3800	7600	179	260	328	9.61
3800	5600	2000	6000	12000	483	678	852	9.61
3800	5600	1600	4800	9600	186	270	342	12.1
3600	5300	2500	7500	15000	504	707	889	12.1

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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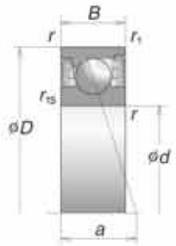
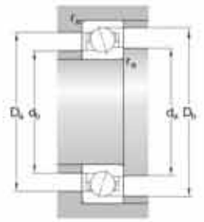
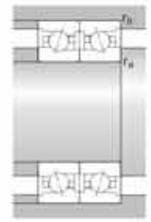
高速陶瓷球角接触球轴承
High speed ceramic angular contact ball bearing

H7000C α=15°

H7000AC α=25°







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Dimension						基本额定载荷 Basic Load		极限转速 Limited speed	重量 Weight
	d	D	B	rsmin	r1smin	a	Cr	Cor	脂 Greas	Mass
	mm	mm	mm	mm	mm	≈	KN	KN	r/min	kg
H7000C-2RZHQ1/P4	10	26	8	0.3	0.15	6	2.2	1.2	90000	0.02
H7000AC-2RZHQ1/P4	10	26	8	0.3	0.15	8	2.1	1.2	75000	0.02
H7001C-2RZHQ1/P4	12	28	8	0.3	0.15	7	2.2	1.3	80000	0.02
H7001AC-2RZHQ1/P4	12	28	8	0.3	0.15	9	2.0	1.2	70000	0.02
H7002C-2RZHQ1/P4	15	32	9	0.3	0.15	8	3.6	2.3	70000	0.03
H7002AC-2RZHQ1/P4	15	32	9	0.3	0.15	10	3.5	2.2	60000	0.03
H7003C-2RZHQ1/P4	17	35	10	0.3	0.15	8	3.8	2.5	63000	0.01
H7003AC-2RZHQ1/P4	17	35	10	0.3	0.15	11	3.6	2.3	53000	0.04
H7004C-2RZHQ1/P4	20	42	12	0.6	0.15	10	6.1	4.3	53000	0.08
H7004AC-2RZHQ1/P4	20	45	12	0.6	0.15	13	5.8	4.1	45000	0.08
H7005C-2RZHQ1/P4	25	47	12	0.6	0.15	11	6.2	4.6	45000	0.09
H7005AC-2RZHQ1/P4	25	47	12	0.6	0.15	14	5.8	4.4	38000	0.09
H7006C-2RZHQ1/P4	30	55	13	1.0	0.3	12	8.6	6.6	38000	0.13
H7006AC-2RZHQ1/P4	30	55	13	1.0	0.3	16	8.1	6.3	32000	0.13
H7007C-2RZHQ1/P4	35	62	14	1.0	0.3	13	9.2	7.8	34000	0.18
H7007AC-2RZHQ1/P4	35	62	14	1.0	0.3	18	8.7	7.4	28000	0.18
H7008C-2RZHQ1/P4	40	68	15	1.0	0.3	15	9.8	8.9	30000	0.2
H7008AC-2RZHQ1/P4	40	68	15	1.0	0.3	20	9.3	8.4	26000	0.2
H7009C-2RZHQ1/P4	45	78	16	1.0	0.3	16	12.5	11.4	26000	0.26
H7009AC-2RZHQ1/P4	45	75	16	1.0	0.3	22	11.8	10.7	24000	0.26
H7010C-2RZHQ1/P4	50	80	16	1.0	0.3	17	12.9	12.4	24000	0.28
H7010AC-2RZHQ1/P4	50	80	16	1.0	0.3	23	12.2	11.7	22000	0.28
H7011C-2RZHQ1/P4	55	90	18	1.1	0.6	26	17.5	16.8	22000	0.41
H7011AC-2RZHQ1/P4	55	90	18	1.1	0.6	26	17.5	16.8	19000	0.41
H7012 C-2RZHQ1/P4	60	95	18	1.1	0.6	19	19.3	19.3	20000	0.43

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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MONTON

轴承 Designation	尺寸 Dimension						基本额定载荷 Basic Load		极限转速 Limited speed	重量 Weight
	d	D	B	rsmin	r1smin	a	Cr	Cor	脂 Greas	Mass
	mm	mm	mm	mm	mm	≈	KN	KN	r/min	kg
H7012 AC-2RZHQ1/P4	60	95	18	1.1	0.6	27	18.2	18.2	18000	0.43
H7013 C-2RZHQ1/P4	65	100	18	1.1	0.6	20	19.9	20.8	20000	0.46
H7013 AC-2RZHQ1/P4	65	100	18	1.1	0.6	28	18.8	19.7	17000	0.46
H7014 C-2RZHQ1/P4	70	110	20	1.1	0.6	22	25.9	26.7	18000	0.64
H7014 AC-2RZHQ1/P4	70	110	20	1.1	0.6	31	24.4	25.2	15000	0.64
H7015 C-2RZHQ1/P4	75	115	20	1.1	0.6	23	26.2	27.8	17000	0.67
H7015 AC-2RZHQ1/P4	75	115	20	1.1	0.6	32	24.7	26.3	15000	0.67
H7016 C-2RZHQ1/P4	80	125	22	1.1	0.6	25	31.2	33.5	16000	0.9
H7016 AC-2RZHQ1/P4	80	125	22	1.1	0.6	35	29.5	31.7	13000	0.9
H7017C-2RZHQ1/P4	85	130	22	1.1	0.6	25	61.6	34.9	15000	0.94
H7017AC-2RZHQ1/P4	85	130	22	1.1	0.6	36	29.9	32.9	13000	0.94
H7018C-2RZHQ1/P4	90	140	24	1.5	0.6	27	37.1	41.4	14000	1.24
H7018AC-2RZHQ1/P4	90	140	24	1.5	0.6	39	35.1	39.1	12000	1.24
H7019C-2RZHQ1/P4	95	145	24	1.5	0.6	28	37.6	43.0	13000	1.26
H7019AC-2RZHQ1/P4	95	145	24	1.5	0.6	40	35.5	40.6	11000	1.26
H7020C-2RZHQ1/P4	100	150	24	1.5	0.6	29	38.1	44.6	12000	1.34
H7020AC-2RZHQ1/P4	100	150	24	1.5	0.6	41	36.0	42.1	11000	1.34
H7021 C-2RZHQ1/P4	105	160	26	2.0	1.0	31	49.1	56.3	12000	1.66
H7021 AC-2RZHQ1/P4	105	160	26	2.0	1.0	44	46.4	53.2	10000	1.66
H7022C-2RZHQ1/P4	110	170	28	2.0	1.0	33	49.7	58.5	11000	2.16
H7022AC-2RZHQ1/P4	110	170	28	2.0	1.0	47	46.9	55.3	9000	2.16
H7024 C-2RZHQ1/P4	120	180	28	2.0	1.0	34	51.0	62.8	10000	2.21
H7024 AC-2RZHQ1/P4	120	180	28	2.0	1.0	49	48.2	58.5	8500	2.21
H7026 C-2RZHQ1/P4	130	200	33	2.0	1.0	39	65.4	81.5	9000	3.52
H7026 AC-2RZHQ1/P4	130	200	33	2.0	1.0	55	61.0	77.0	7500	3.52

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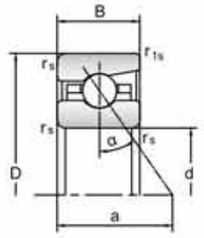
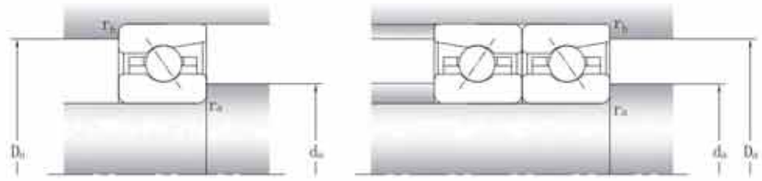
MONTON

高速精密角接触球轴承
Precision Angular Contact Ball Bearings

7200C Series α=15°

7200AC Series α=25°





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					安装尺寸Abutment Dimensions				额定载荷 Loading ratings	
	d	D	B	ramin	r1min	da	Da/Db	ra	rb	Cr	Cor
	mm					min	max	max	max	kN	
7204C	20	47	14	1.0	0.3	26.5	40.5	1.0	0.3	13.1	9.6
7204AC	20	47	14	1.0	0.3	26.5	40.5	1.0	0.3	12.6	9.2
7205C	25	52	15	1.0	0.3	30.5	46.5	1.0	0.3	16.8	13.1
7205AC	25	52	15	1.0	0.3	30.5	46.5	1.0	0.3	16.1	12.5
7206C	30	62	16	1.0	0.3	36.5	55.5	1.0	0.3	23.4	18.8
7206AC	30	62	16	1.0	0.3	36.5	55.5	1.0	0.3	22.3	18
7207C	35	72	17	1.1	0.6	44	63	1.1	0.6	25.8	22.9
7207AC	35	72	17	1.1	0.6	44	63	1.1	0.6	24.5	21.9
7208C	40	80	18	1.1	0.6	49	71	1.1	0.6	34.1	30.9
7208AC	40	80	18	1.1	0.6	49	71	1.1	0.6	32.5	29.5
7209C	45	85	19	1.1	0.6	54	76	1.1	0.6	35.5	33.8
7209AC	45	85	19	1.1	0.6	54	76	1.1	0.6	33.8	32.3
7210C	50	90	20	1.1	0.6	57.5	83	1.1	0.6	43.3	40.6
7210AC	50	90	20	1.1	0.6	57.5	83	1.1	0.6	41.3	38.7
7211C	55	100	21	1.5	0.6	63	92	1.5	0.6	53.6	51.1
7211AC	55	100	21	1.5	0.6	63	92	1.5	0.6	51.1	48.8
7212C	60	110	22	1.5	0.6	71.5	100.5	1.5	0.6	55.8	56.2
7212AC	60	110	22	1.5	0.6	71.5	100.5	1.5	0.6	53	53.5
7213C	65	120	23	1.5	0.6	76.5	108.5	1.5	0.6	67.5	69
7213AC	65	120	23	1.5	0.6	76.5	108.5	1.5	0.6	64.2	65.8
7214C	70	125	24	1.5	0.6	81.5	113.5	1.5	0.6	70.2	74.6
7214AC	70	125	24	1.5	0.6	81.5	113.5	1.5	0.6	66.6	71.1

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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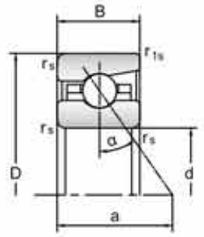
极限转速 Attainalbe Spped		预载荷 Preloading Force			轴向刚度 Axial Rigidity			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	A(轻)	B(中)	C(重)	—
r/min		N			N/μm			Kg
34000	50000	70	210	420	27	39	49	0.11
30000	45000	115	340	680	72	100	126	0.11
30000	45000	90	270	540	32	46	58	0.14
26000	40000	150	450	900	85	119	150	0.14
24000	38000	120	360	720	38	55	69	0.21
20000	34000	200	600	1200	101	141	178	0.21
18000	30000	135	400	800	44	63	79	0.31
17000	28000	220	660	1320	116	162	204	0.31
17000	28000	180	540	1080	50	72	92	0.4
15000	24000	295	880	1760	134	187	235	0.4
16000	26000	187	560	1120	53	77	97	0.45
14000	22000	300	900	1800	142	199	250	0.45
15000	24000	225	670	1340	57	82	104	0.49
14000	22000	365	1090	2180	151	212	267	0.49
14000	22000	290	870	1740	63	91	116	0.65
13000	20000	460	1380	2760	169	236	297	0.65
12000	19000	305	910	1820	67	97	123	0.86
11000	18000	480	1440	2880	179	251	316	0.86
11000	18000	355	1060	2120	74	107	136	1.08
9500	16000	570	1710	3420	198	277	348	1.08
10000	17000	370	1110	2220	78	113	143	1.19
9000	15000	590	1770	3540	209	293	368	1.19

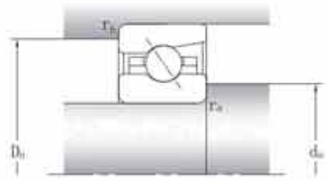
MONTON

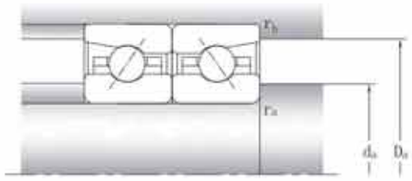
高速精密角接触球轴承
Precision Angular Contact Ball Bearings

7200C Series α=15°

7200AC Series α=25°







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					安装尺寸Abutment Dimensions				额定载荷 Loading ratings	
	d	D	B	ramin	r1min	da	Da/Db	ra	rb	Cr	Cor
	mm					min	max	max	max	kN	
7215C	75	130	25	1.5	0.6	86.5	118.5	1.5	0.6	72.7	80.2
7215AC	75	130	25	1.5	0.6	86.5	118.5	1.5	0.6	68.9	76.3
7216C	80	140	26	2.0	1.0	92.5	128	2.0	1.0	86.5	96.5
7216AC	80	140	26	2.0	1.0	92.5	128	2.0	1.0	82.1	91.9
7217C	85	150	28	2.0	1.0	98.5	137	2.0	1.0	97.4	107.5
7217AC	85	150	28	2.0	1.0	98.5	137	2.0	1.0	92.5	102.4
7218C	90	160	30	2.0	1.0	103	147	2.0	1.0	121.9	131.3
7218AC	90	160	30	2.0	1.0	103	147	2.0	1.0	115.8	124.6
7219C	95	170	32	2.1	1.1	112	153	2.1	1.1	128.9	145.1
7219AC	95	170	32	2.1	1.1	112	153	2.1	1.1	122.5	138.3
7220C	100	180	34	2.1	1.1	116	164	2.1	1.1	146.2	165.9
7220AC	100	180	34	2.1	1.1	116	164	2.1	1.1	138.9	158.2
7221C	105	190	36	2.1	1.1	122	173	2.1	1.1	164.3	188.2
7221AC	105	190	36	2.1	1.1	122	173	2.1	1.1	156.3	179.5
7222C	110	200	38	2.1	1.1	130	181	2.1	1.1	170.4	202.5
7222AC	110	200	38	2.1	1.1	130	181	2.1	1.1	161.8	193
7224C	120	215	40	2.1	1.1	143	192	2.1	1.1	175.4	218.4
7224AC	120	215	40	2.1	1.1	143	192	2.1	1.1	166.3	207.9
7226C	130	230	40	3.0	1.1	151.5	209	3.0	1.1	200.6	258.3
7226AC	130	230	40	3.0	1.1	151.5	209	3.0	1.1	190.4	246.2
7228C	140	250	42	3.0	1.1	165	225.5	3.0	1.1	223.6	306.6
7228AC	140	250	42	3.0	1.1	165	225.5	3.0	1.1	212.3	292.2

极限转速 Attainalbe Spped		预载荷 Preloading Force			轴向刚度 Axial Rigidity			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	A(轻)	B(中)	C(重)	≈
r/min		N			N/μm			Kg
9500	16000	385	1150	2300	82	119	151	1.29
8500	14000	615	1840	3680	220	309	388	1.29
9000	15000	460	1380	2760	90	130	165	1.58
8000	13000	750	2250	4500	240	338	424	1.58
8500	14000	515	1540	3080	93	134	169	1.96
7500	12000	825	2470	4940	247	347	436	1.96
8000	13000	655	1960	3920	110	160	202	2.44
7000	11000	1050	3150	6300	276	394	496	4.44
7500	11000	1050	3150	6300	276	394	496	2.93
6700	10000	1050	3150	6300	286	410	517	2.93
7000	11000	770	2310	4620	114	165	208	3.51
6700	10000	1240	3720	7440	305	427	537	3.51
7000	11000	890	2670	5340	121	175	221	4.17
6300	9500	1430	4290	8580	323	454	570	4.17
6700	10000	920	2760	5520	127	184	233	4.95
6000	9000	1480	4440	8880	341	478	601	4.95
6000	9000	950	2850	5700	133	193	245	6.01
5300	8000	1500	4500	9000	358	502	631	6.01
5600	8500	1050	3100	6200	139	202	255	6.41
5000	7500	1600	4800	9600	373	525	659	6.41
5000	7500	1200	3600	7200	152	221	279	8.17
4500	6700	1900	5700	11400	410	575	723	8.17

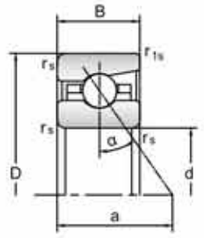
注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

MONTON

高速精密角接触球轴承
Precision Angular Contact Ball Bearings

7200C Series $\alpha=15°$

7200AC Series $\alpha=25°$



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					安装尺寸Abutment Dimensions				额定载荷 Loading ratings	
	d	D	B	ramin	r1min	da	Da/Db	ra	rb	Cr	Cor
	mm					min	max	max	max	kN	
7230C	150	270	45	3.0	1.1	178.5	242.0	3.0	1.1	240.9	341.5
7230AC	150	270	45	3.0	1.1	178.5	242.0	3.0	1.1	228.7	325.5
7232C	160	290	48	3.0	1.1	193.5	257.0	3.0	1.1	248.6	365.8
7232AC	160	290	48	3.0	1.1	193.5	257.0	3.0	1.1	236.1	348.6
7234C	170	310	52	4.0	1.5	202	278.5	4.0	1.5	300.2	459.2
7234AC	170	310	52	4.0	1.5	202	278.5	4.0	1.5	285	437.6
7236C	180	320	52	4.0	1.5	212	288.5	4.0	1.5	311.2	490.8
7236AC	180	320	52	4.0	1.5	212	288.5	4.0	1.5	295.5	467.7
7238C	190	340	55	4.0	1.5	227	303.5	4.0	1.5	321.3	524.8
7238AC	190	340	55	4.0	1.5	227	303.5	4.0	1.5	305.1	500.1
7240C	200	360	58	4.0	1.5	242	318.5	4.0	1.5	330.9	558.6
7240AC	200	360	58	4.0	1.5	242	318.5	4.0	1.5	314.2	532.3

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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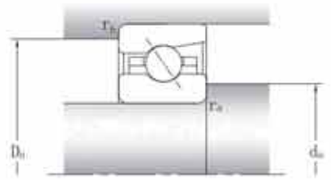
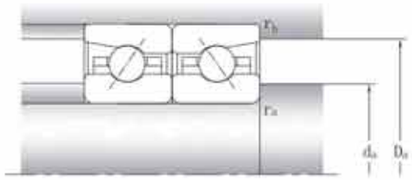
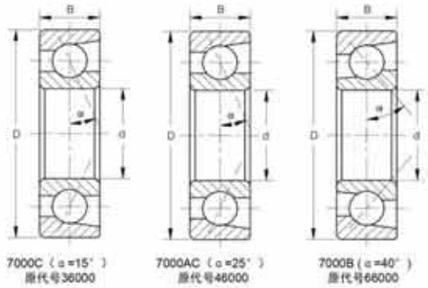




极限转速 Attainalbe Spped		预载荷 Preloading Force			轴向刚度 Axial Rigidity			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	A(轻)	B(中)	C(重)	—
r/min		N			N/μm			Kg
4500	6700	1280	3800	7600	158	229	290	10.38
4000	6000	2050	6100	12200	426	599	753	10.38
4300	6300	1330	4000	8000	165	240	303	13.1
3800	5600	2100	6300	12600	446	627	788	13.1
3800	5600	1600	4800	9600	173	251	318	15.93
3600	5300	2500	7500	15000	468	658	827	15.93
3800	5600	1660	4900	9800	181	264	334	16.61
3400	5000	2650	7900	15800	492	691	869	16.61
3400	5000	1700	5100	10200	190	276	349	20.29
3200	4800	2700	8100	16200	515	724	910	20.29
3200	4800	1760	5300	10600	198	288	365	24.49
3000	4500	2800	8400	16800	538	756	951	24.49



精密角接触球轴承
Precision Angular Contact Ball Bearings

7300C Series α=15°

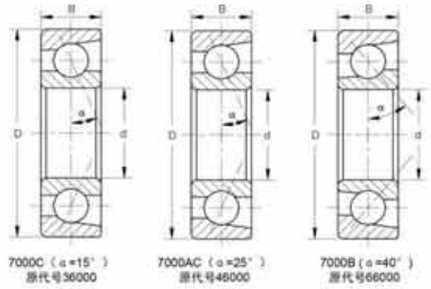
7300AC Series α=25°

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	基本(mm) Principal Dimensions			额定负荷(KN) Basic Load Ratings		极限转速(rpm) Limited Speed		重量(kg) Weight
	d	D	B	动负荷Cr Dynamic	静负荷Cor Static	脂润滑 Grease	油润滑 Oil	≈
7300C	10	35	11	9.8	4.6	19000	26000	0.053
7301AC	12	37	12	11.5	5.4	17000	24000	0.06
7301B	12	37	12	10.5	4.9	17000	22000	0.06
7301C	12	37	12	11.8	5.6	18000	24000	0.06
7302AC	15	42	13	12.5	6.2	15000	21000	0.084
7302B	15	42	13	12.4	6.5	15000	19000	0.08
7302C	15	42	13	13.2	6.7	16000	21000	0.084
7303AC	17	47	14	15	7.7	13000	19000	0.11
7303B	17	47	14	14.1	8.1	13000	17000	0.11
7303C	17	47	14	15.7	8.2	13000	19000	0.11
7304AC	20	52	15	17.9	9.6	12000	17000	0.15
7304B	20	52	15	17.3	9.6	11000	15000	0.14
7304C	20	52	15	18.4	9.8	12000	17000	0.15
7305AC	25	62	17	27	15.6	9500	14000	0.23
7305B	25	62	17	24.3	14.1	9000	13000	0.23
7305C	25	62	17	27.8	15.9	9500	14000	0.23
7306AC	30	72	19	32.8	20.4	8500	12000	0.35
7306B	30	72	19	29.3	18.1	8000	11000	0.34
7306C	30	72	19	33.2	21.2	8500	12000	0.35
7307AC	35	80	21	38.2	24.9	7500	10000	0.47
7307B	35	80	21	38.3	24.4	7000	9500	0.45
7307C	35	80	21	40.3	25.8	7500	10000	0.47
7308AC	40	90	23	47	31.1	6700	9000	0.66
7308B	40	90	23	46.5	29.5	6300	8500	0.63
7308C	40	90	23	49.3	32.3	6700	9000	0.66
7309AC	45	100	25	61.6	41.2	6000	8000	0.86
7309B	45	100	25	59.6	39.6	5600	7500	0.85
7309C	45	100	25	63.1	42.9	6000	8000	0.86
7310AC	50	110	27	71.9	48.5	5600	7500	1.08
7310B	50	110	27	68.1	48	5000	6700	1.1
7310C	50	110	27	74.9	50.9	5600	7500	1.08
7311AC	55	120	29	83.4	58	5000	3700	1.42
7311B	55	120	29	82.2	56.2	4500	6300	1.4
7311C	55	120	29	86.4	59.5	5000	6700	1.42
7312AC	60	130	31	95.2	67.2	4800	6300	1.71

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

MONTON



轴承 Designation	基本(mm) Principal Dimensions			额定负荷(KN) Basic Load Ratings		极限转速(rpm) Limited Speed		重量(kg) Weight
	d	D	B	动负荷Cr Dynamic	静负荷Cor Static	脂润滑 Grease	油润滑 Oil	≈
7312B	60	130	31	91.5	65.4	4300	5600	1.75
7312C	60	130	31	98.6	68.5	4800	6300	1.71
7313AC	65	140	33	109.3	78.3	4300	5600	2.23
7313B	65	140	33	102.3	75.3	3800	5300	2.15
7313C	65	140	33	113.1	79.6	4300	5600	2.23
7314AC	70	150	35	118.8	88.2	4000	5300	2.67
7314B	70	150	35	114.6	85.9	3600	5000	2.65
7314C	70	150	35	126	91.6	4000	5300	2.67
7315AC	75	160	37	134.4	99.8	3800	5000	3.1
7315B	75	160	37	127.7	95.4	3400	4800	3.2
7315C	75	160	37	140.7	103.9	3800	5000	3.1
7316AC	80	170	39	149.5	107.7	3600	4800	3.6
7316B	80	170	39	141.4	107.9	3200	4800	3.8
7316C	80	170	39	156.1	112.2	3600	4800	3.6
7317AC	85	180	41	154.3	122.3	3400	4500	4.38
7317B	85	180	41	155.8	120.9	3000	4000	4.45
7317C	85	180	41	160.7	130.5	3400	4500	4.38
7318AC	90	190	43	177.6	153.5	3200	4300	5.6
7318B	90	190	43	157.9	136.9	3000	4000	5.3
7318C	90	190	43	184.9	159.9	3200	4300	5.6
7319AC	95	200	45	193.3	172.6	3200	4200	6.6
7319B	95	200	45	172	154.1	2800	4000	6.4
7319C	95	200	45	201.1	179.8	3200	4200	6.6
7320AC	100	215	47	213.5	198.6	3000	4000	7.58
7320B	100	215	47	190	177.3	2600	3800	7.29
7320C	100	215	47	222.1	206.7	3000	4000	7.58
7321AC	105	225	49	226.7	216.6	2800	3800	8.85
7321B	105	225	49	201.7	193.3	2400	3600	8.55
7321C	105	225	49	235.8	225.6	2800	3800	8.85
7322AC	110	240	50	253.2	252.4	2600	3600	10.5
7322B	110	240	50	225.8	225.3	2200	3400	9.84
7322C	110	240	50	263.2	261.9	2600	3600	10.5

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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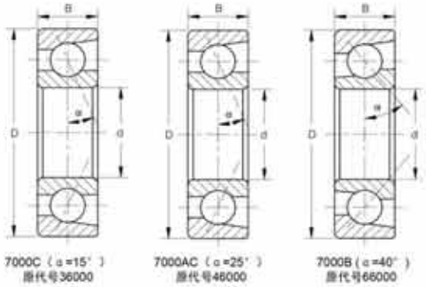


精密角接触球轴承
Precision Angular Contact Ball Bearings

7300C Series α=15°

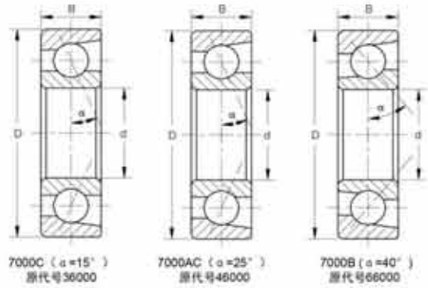
7300AC Series α=25°

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	基本(mm) Principal Dimensions			额定负荷(KN) Basic Load Ratings		极限转速(rpm) Limited Speed		重量(kg) Weight
	d	D	B	动负荷Cr Dynamic	静负荷Cor Static	脂润滑 Grease	油润滑 Oil	≈
7324AC	120	260	55	265.4	269.5	2200	3200	14.2
7324B	120	260	55	250.4	262	1900	2800	14.5
7324C	120	260	55	275.9	280.4	2200	3200	14.2
7326AC	130	280	58	309.8	337.7	1800	2500	17.4
7326B	130	280	58	302.5	336.9	1700	2300	17.5
7326C	130	280	58	322.1	351.5	1800	2500	17.4
7328AC	140	300	62	339.1	385.1	1700	2300	21.2
7328B	140	300	62	329.1	381.4	1600	2200	21
7328C	140	300	62	352.9	401.1	1700	2300	21.2
7330AC	150	320	65	369	435.5	1600	2250	26
7330B	150	320	65	356.5	428.6	1400	1900	25.1
7330C	150	320	65	384.1	453.6	1600	2250	26
7332AC	160	340	68	370	446.3	1500	2000	26
7332B	160	340	68	384.4	478.5	1200	1600	25.4
7332C	160	340	68	386.1	464.1	1500	2000	26

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

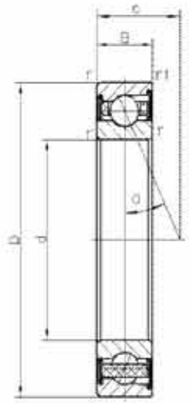
MONTON

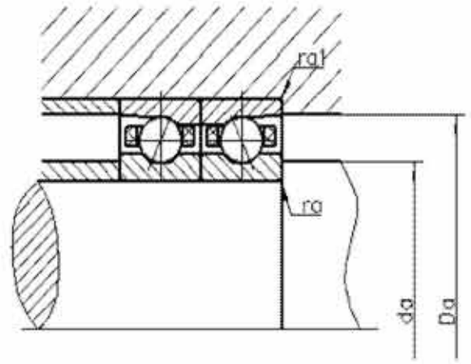


轴承 Designation	基本(mm) Principal Dimensions			额定负荷(KN) Basic Load Ratings		极限转速(rpm) Limited Speed		重量(kg) Weight
	d	D	B	动负荷Cr Dynamic	静负荷Cor Static	脂润滑 Grease	油润滑 Oil	≈
7406AC	30	90	23	55.6	32.7	6500	85000	0.96
7406C	30	90	23	57.5	33.8	6500	85000	0.96
7407AC	35	100	25	66.4	41.9	5500	8000	1.14
7407C	35	100	25	66.8	41.2	5500	8000	1.14
7408AC	40	110	27	73.7	42.1	5200	7000	1.4
7408C	40	110	27	80.2	53.3	5200	7000	1.4
7409AC	45	120	29	84.5	55.1	5000	6500	1.8
7409C	45	120	29	93.1	60.8	5000	6500	1.8
7410AC	50	130	31	115.8	78.3	4500	6000	2.25
7410C	50	130	31	119.3	81	4500	6000	2.25
7411AC	55	140	33	121.4	84.5	4200	5600	2.75
7411C	55	140	33	125.3	87	4200	5600	2.75
7412AC	60	150	35	131.8	95.3	3800	5200	3.4
7412C	60	150	35	136.3	98.2	3800	5200	3.4
7413AC	65	160	37	142.5	106.7	3400	4800	4.2
7413C	65	160	37	147.4	110.2	3400	4800	4.2
7414AC	70	180	42	154.6	122	3200	4500	5.8
7414C	70	180	42	160.4	126.6	3200	4500	5.8
7415AC	75	190	45	165.2	133.5	3000	4200	7
7415C	75	190	45	171.4	138.9	3000	4200	7
7416AC	80	200	48	176.5	147.2	2800	4000	7.4
7416C	80	200	48	183.2	152.9	2800	4000	7.4
7417AC	85	210	52	188	161.5	2600	3700	9.6
7417C	85	210	52	195.1	167.6	2600	3700	9.6
7418AC	90	225	54	200.3	178.1	2400	3400	11.2
7418C	90	225	54	208	184.2	2400	3400	11.2

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

密封接触角球轴承
Angular contact ball bearing with sealing





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	外型尺寸 Dimension			α=15° 极限转速 Limited Speed				α=25° 极限转速 Limited Speed				保持架材质 CAGE
	内径ID	外径OD	高度 B	额定载额 Cr	Cor	脂 Grease	油 Oil	油额定载额 Cr	Cor	脂 Grease	油 Oil	
H7000C-2RZ/P4	10	26	8	3.4	1.5	79000	129000	3.3	1.4	66000	109000	胶木
H7001C-2RZ/P4	12	28	8	3.8	1.7	69000	109000	3.6	1.6	59000	89000	胶木
H7002C-2RZ/P4	15	32	9	4.4	2.2	66000	99000	4.2	2.1	55000	84000	胶木
H7003C-2RZ/P4	17	35	10	5.2	2.5	55000	84000	5.0	2.4	49000	74000	胶木
H7004C-2RZ/P4	20	42	12	7.4	3.9	49000	74000	7.0	3.8	42000	62000	胶木
H7005C-2RZ/P4	25	47	12	8.4	4.8	42000	62000	8.0	4.6	35000	52000	胶木
H7006C-2RZ/P4	30	55	13	9.5	6.2	37000	55000	9.0	5.9	33000	49000	胶木
H7007C-2RZ/P4	35	62	14	11.2	7.9	37000	55000	10.7	7.5	33000	49000	胶木
H7008C-2RZ/P4	40	68	15	19.9	19.1	18000	31000	18.9	18.2	16000	27000	胶木
H7009C-2RZ/P4	45	75	16	26.7	25.3	16000	27000	25.4	24.1	15000	25000	胶木
H7010C-2RZ/P4	50	80	16	27.6	27.5	15000	25000	26.2	26.2	14000	23000	胶木
H7011C-2RZ/P4	55	90	18	36.7	37.1	13000	21000	34.8	35.3	12000	19000	胶木
H7012C-2RZ/P4	60	95	18	37.8	40.0	13000	21000	35.8	38.0	11000	18000	胶木
H7013C-2RZ/P4	65	100	18	38.9	42.9	12000	19000	36.8	40.7	10000	17000	胶木
H7014C-2RZ/P4	70	110	20	49.9	55.5	11000	18000	47.2	52.7	9000	16000	胶木
H7015C-2RZ/P4	75	115	20	51.3	59.2	10000	17000	48.5	56.2	8500	15000	胶木
H7016C-2RZ/P4	80	125	22	61.6	70.4	9000	16000	58.3	66.9	8000	14000	胶木
H7017C-2RZ/P4	85	130	22	63.6	75.0	8500	15000	59.9	71.3	7500	13000	胶木
H7018C-2RZ/P4	90	140	24	66.9	84.0	8000	14000	63.2	79.7	7000	12000	胶木
H7019C-2RZ/P4	95	145	24	79.1	97.6	7500	13000	74.8	92.7	6500	11000	胶木
H7020C-2RZ/P4	100	150	24	81.2	103.3	7000	12000	76.7	9.8	6000	10000	胶木
H7021C-2RZ/P4	105	160	26	93.9	118.2	6500	11000	88.8	112.2	6000	10000	胶木
H7022C-2RZ/P4	110	170	28	110.0	139.8	6000	10000	104.4	132.8	5700	9000	胶木
H7024C-2RZ/P4	120	180	28	112.0	148.7	6000	10000	106.3	141.1	5700	9000	胶木
H7026C-2RZ/P4	130	200	33	144.0	190.8	5700	9000	136.8	181.0	5000	8000	胶木
H7028C-2RZ/P4	140	210	33	148.0	202.6	5000	8000	140.4	192.2	4600	7500	胶木
H7030C-2RZ/P4	150	225	35	168.0	232.5	4600	7500	159.1	220.6	4000	6500	胶木
H7032C-2RZ/P4	160	240	38	189.0	264.5	4000	6500	178.6	251.0	3800	6000	胶木
H7034C-2RZ/P4	170	260	42	205.0	299.3	3800	6000	194.2	284.0	3300	5300	胶木
H7036C-2RZ/P4	180	280	46	229.0	352.1	3500	5700	216.8	334.1	3000	5000	胶木

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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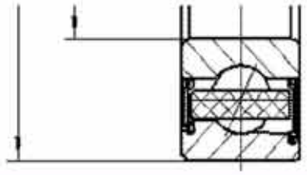
密封接触角球轴承
Sealed angular contact ball bearing



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	外型尺寸 Dimension			α=15° 极限转速 Limited Speed			
	内径ID	外径OD	高度 B	额定载额		脂	油
				Cr	Cor	Grease	Oil
H71900C-2RZ/P4	10	22	6	2.9	1.8	69000	109000
H71901C-2RZ/P4	12	24	6	3.2	2.2	62000	94000
H71902C-2RZ/P4	15	28	7	4.8	3.4	52000	79000
H71903C-2RZ/P4	17	30	7	5.1	3.8	49000	74000
H71904C-2RZ/P4	20	37	9	7.4	5.8	39000	59000
H71905C-2RZ/P4	25	42	9	7.6	6.5	33000	49000
H71906C-2RZ/P4	30	17	9	8.0	7.6	29000	44000
H71907C-2RZ/P4	35	55	10	11.0	10.9	25000	39000
H71908C-2RZ/P4	40	62	12	14.0	14.2	19000	33000
H71909C-2RZ/P4	45	68	12	14.7	16.1	17000	29000
H71910C-2RZ/P4	50	72	12	19.0	21.2	16000	27000
H71911C-2RZ/P4	55	80	13	23.7	27.4	14000	23000
H71912C-2RZ/P4	60	85	13	24.8	30.3	13000	21000
H71913C-2RZ/P4	65	90	13	25.1	31.9	12000	19000
H71914C-2RZ/P4	70	100	16	34.5	43.3	11000	18000
H71915C-2RZ/P4	75	105	16	25.0	45.6	10000	17000
H71916C-2RZ/P4	80	110	16	35.5	47.8	9000	16000
H71917C-2RZ/P4	85	120	18	46.5	61.9	8500	15000
H71918C-2RZ/P4	90	115	18	47.2	64.8	8000	15000
H71919C-2RZ/P4	95	130	18	47.9	67.8	8000	14000
H71920C-2RZ/P4	100	140	20	60.4	84.4	7500	13000
H71921C-2RZ/P4	105	145	20	61.4	88.2	7000	12000
H71922C-2RZ/P4	110	150	20	62.3	91.9	6500	11000
H71924C-2RZ/P4	120	165	22	73.7	107.6	6000	10000
H71926C-2RZ/P4	130	180	24	76.3	117.1	5700	9000
H71928C-2RZ/P4	140	190	24	78.9	126.4	5000	8000
H71930C-2RZ/P4	150	210	28	118.2	175.1	4600	7500
H71932C-2RZ/P4	160	220	28	23.3	191.2	4000	6500
H71934C-2RZ/P4	170	230	28	125.7	200.0	3800	6000
H71936C-2RZ/P4	180	250	33	159.7	249.1	3500	5700
H71938C-2RZ/P4	190	260	33	162.8	260.8	3300	5300

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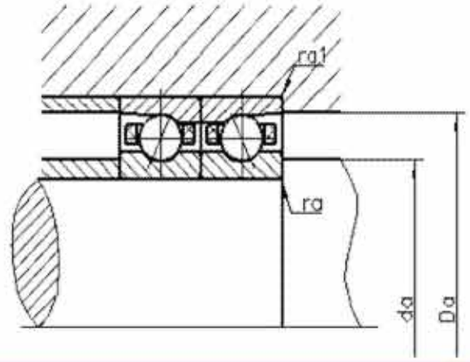

α=25° 极限转速 Limited Speed				保持架材质 CAGE
油额定载额		脂	油	
Cr	Cor	Grease	Oil	
2.7	1.7	66000	90000	胶木
3.1	2.1	55000	84000	胶木
4.6	3.2	49000	74000	胶木
4.8	3.6	44000	66000	胶木
7.0	5.6	37000	55000	胶木
7.2	6.2	29000	44000	胶木
7.6	7.2	25000	39000	胶木
10.4	10.3	19000	33000	胶木
13.3	13.5	17000	29000	胶木
13.9	15.2	16000	27000	胶木
17.9	20.1	14000	23000	胶木
22.4	26	13000	21000	胶木
23.3	28.7	12000	19000	胶木
23.6	30.2	11000	18000	胶木
32.6	41.2	10000	17000	胶木
33	43.2	8500	15000	胶木
33.5	45.3	8000	14000	胶木
43.8	58.6	7500	13000	胶木
20.4	31.6	7500	13000	胶木
45.2	64.1	7000	12000	胶木
56.9	79.9	7000	12000	胶木
57.8	83.5	6500	11000	胶木
58.7	87	6000	10000	胶木
69.5	101.9	5700	9000	胶木
71.9	110.9	5000	8000	胶木
74.4	119.7	4600	7500	胶木
111.4	165.8	4000	6500	胶木
116.5	181.1	3800	6000	胶木
118.5	189.4	3300	5300	胶木
150.6	235.9	3000	5000	胶木
153.5	247.0	2800	4600	胶木

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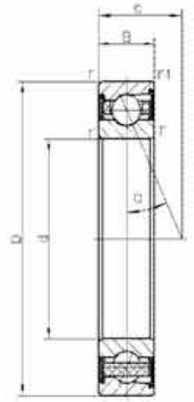

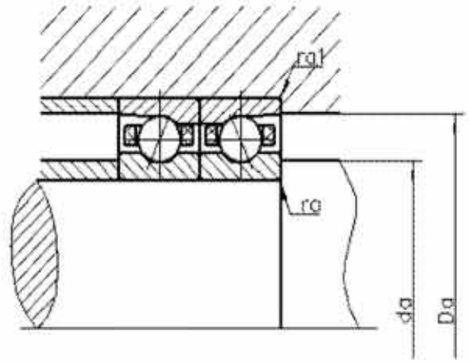

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密封接触角球轴承
Sealed angular contact ball bearing

尺寸表 · 单位：mm　Dimenisons Unit:mm

轴承 Designation	外型尺寸 Dimension			α=15° 极限转速 Limited Speed				α=25° 极限转速 Limited Speed				保持架材质 CAGE
	内径ID	外径OD	高度 B	额定载额 Cr	Cor	脂 Grease	油 Oil	油额定载额 Cr	Cor	脂 Grease	油 Oil	
H71800C-2RZ/P4	10	19	5	1.8	1.1	74000	119000	1.7	1.1	69000	109000	胶木
H71801C-2RZ/P4	12	21	5	2.0	1.4	69000	109000	1.9	1.3	62000	94000	胶木
H71802C-2RZ/P4	15	24	5	2.2	1.8	59000	89000	2.1	1.7	53000	79000	胶木
H71803C-2RZ/P4	17	25	5	2.3	1.9	52000	79000	2.1	1.8	49000	74000	胶木
H71804C-2RZ/P4	20	32	7	3.9	3.4	44000	66000	3.7	3.2	39000	59000	胶木
H71805C-2RZ/P4	25	37	7	4.2	4.1	37000	55000	3.9	3.9	33000	49000	胶木
H71806C-2RZ/P4	30	42	7	4.4	4.8	31000	47000	4.1	4.5	27000	42000	胶木
H71807C-2RZ/P4	35	47	7	4.6	5.5	25000	39000	4.3	5.2	23000	37000	胶木
H71808C-2RZ/P4	40	52	7	4.8	6.2	23000	37000	4.5	5.8	19000	33000	胶木
H71809C-2RZ/P4	45	58	7	4.9	6.7	19000	33000	4.6	6.3	17000	29000	胶木
H71810C-2RZ/P4	50	65	7	7.4	10.0	17000	29000	6.9	9.5	15000	25000	胶木
H71811C-2RZ/P4	55	72	9	10.2	13.8	15000	25000	9.6	13.1	14000	23000	胶木
H71812C-2RZ/P4	60	78	10	13.4	18.0	14000	23000	12.6	17.0	13000	21000	胶木
H71813C-2RZ/P4	65	85	10	13.4	18.8	13000	21000	12.6	17.8	12000	19000	胶木
H71814C-2RZ/P4	70	90	10	13.8	20.3	12000	19000	13.0	19.1	11000	18000	胶木
H71815C-2RZ/P4	75	95	10	14.2	21.7	11000	18000	13.3	20.5	10000	17000	胶木
H71816C-2RZ/P4	80	100	10	14.5	23.1	10000	17000	13.6	21.8	85000	15000	胶木
H71817C-2RZ/P4	85	110	13	21.5	32.2	9000	16000	20.2	30.5	8000	14000	胶木
H71818C-2RZ/P4	90	115	13	21.7	33.5	8500	15000	20.4	31.6	7500	13000	胶木
H71819C-2RZ/P4	95	120	13	21.9	34.7	8000	14000	20.6	32.8	7500	13000	胶木
H71820C-2RZ/P4	100	125	13	22.5	37.0	7500	13000	21.2	34.9	7000	12000	胶木
H71821C-2RZ/P4	105	130	13	22.7	38.3	7500	13000	21.3	36.1	7000	12000	胶木
H71822C-2RZ/P4	110	140	16	31.8	51.6	7000	12000	29.9	48.7	6500	11000	胶木
H71824C-2RZ/P4	120	150	16	33.1	56.9	60000	10000	31.3	53.7	5700	9000	胶木
H71826C-2RZ/P4	130	165	18	38.7	67.6	5700	9000	36.3	63.8	5000	8000	胶木
H71828C-2RZ/P4	140	175	18	44.8	79.2	5000	8000	42.0	74.7	4600	7500	胶木
H71830C-2RZ/P4	150	190	20	51.2	92.0	4600	7500	48.0	86.8	4000	6500	胶木
H71832C-2RZ/P4	160	200	20	52.4	97.7	4000	6500	49.2	92.2	3800	6000	胶木
H71834C-2RZ/P4	170	215	22	66.5	123.4	3800	6000	62.4	116.5	3300	5300	胶木
H71836C-2RZ/P4	180	225	22	159.7	249.1	3500	5700	150.6	235.9	3000	5000	胶木

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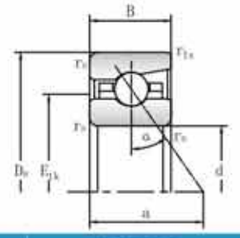
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
718...系列 718... Series



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71800C	10	19	5	0.3	0.1	1.9	0.98
71800AC	10	19	5	0.3	0.1	1.9	0.98
71801C	12	21	5	0.3	0.1	2.08	1.18
71801AC		21	5	0.3	0.1	1.96	1.12
71802C	15	24	5	0.3	0.1	2.28	1.5
71802AC	15	24	5	0.3	0.1	2.16	1.4
71803C	17	26	5	0.3	0.1	2.32	1.6
71803AC	17	26	5	0.3	0.1	2.2	1.53
71804C	20	32	7	0.3	0.1	3.8	2.65
71804AC	20	32	7	0.3	0.1	3.65	2.5
71805C	25	37	7	0.3	0.1	4.15	3.2
71805AC	25	37	7	0.3	0.1	3.9	3
71806C	30	42	7	0.3	0.1	4.4	3.65
71806AC	30	42	7	0.3	0.1	4.15	3.4
71807C	35	47	7	0.3	0.1	4.65	4.15
71807AC	35	47	7	0.3	0.1	4.4	3.8
71808C	40	52	7	0.3	0.1	4.8	4.55
71808AC	40	52	7	0.3	0.1	4.55	4.25
71809C	45	58	7	0.3	0.1	7.2	6.95
71809AC	45	58	7	0.3	0.1	6.8	6.4
71810C	50	65	7	0.3	0.1	7.35	7.35
71810AC	50	65	7	0.3	0.1	6.95	6.8
71811C	55	72	9	0.3	0.1	10.2	10.2
71811AC	55	72	9	0.3	0.1	9.65	9.5

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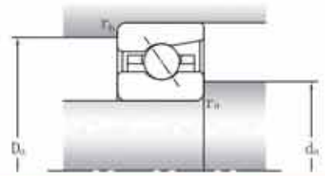

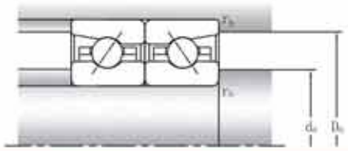

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	≈
r/min		N			Kg
75000	100000	7	23	54	0.005
70000	100000	8	31	80	0.005
67000	100000	7	25	58	0.01
60000	90000	8	33	85	0.01
56000	85000	8	27	63	0.01
50000	75000	8	34	91	0.01
50000	75000	8	26	64	0.01
48000	70000	7	33	92	0.01
43000	63000	15	50	114	0.02
38000	56000	18	70	174	0.02
36000	53000	16	54	123	0.02
32000	48000	18	72	181	0.02
30000	45000	16	56	129	0.03
28000	43000	18	73	189	0.03
26000	40000	17	58	135	0.03
24000	38000	19	76	197	0.03
24000	38000	17	59	138	0.03
22000	36000	17	75	199	0.03
22000	36000	22	98	221	0.04
19000	32000	35	133	328	0.04
19000	32000	21	99	224	0.05
17000	28000	34	133	332	0.05
17000	28000	35	147	326	0.08
16000	26000	57	206	491	0.08

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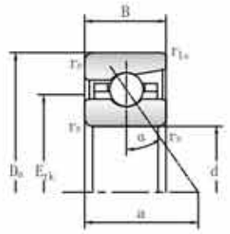
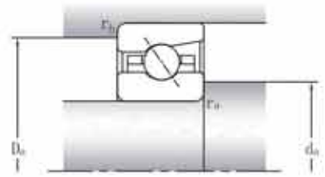
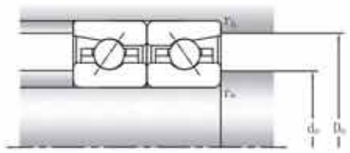
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
718...系列 718... Series







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71812C	60	78	10	0.3	0.1	13.2	13.2
71812AC	60	78	10	0.3	0.1	12.2	12.2
71813C	65	85	10	0.6	0.3	13.4	14
71813AC	65	85	10	0.6	0.3	12.7	12.9
71814C	70	90	10	0.6	0.3	14	15
71814AC	70	90	10	0.6	0.3	12.9	13.7
71815C	75	95	10	0.6	0.3	14.3	15.6
71815AC	75	95	10	0.6	0.3	13.4	14.6
71816C	80	100	10	0.6	0.3	14.6	16.6
71816AC	80	100	10	0.6	0.3	13.7	15.6
71817C	85	110	13	1	0.3	21.6	24
71817AC	85	110	13	1	0.3	20.4	22.4
71818C	90	115	13	1.00	0.30	21.20	23.60
71818AC	90	115	13	1.00	0.30	20.00	22.00
71819C	95	120	13	1.00	0.30	21.60	24.50
71819AC	95	120	13	1.00	0.30	20.40	22.80
71820C	100	125	13	1	0.3	21.6	25
71820AC	100	125	13	1	0.3	20.4	23.6
71821C	105	130	13	1	0.3	22.8	27.5
71821AC	105	130	13	1	0.3	21.6	25.5
71822C	110	140	16	1	0.3	31.5	36.5
71822AC	110	140	16	1	0.3	29	34

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	-
r/min		N			Kg
16000	26000	51	200	435	0.1
14000	22000	80	280	649	0.1
15000	24000	51	201	440	0.13
13000	20000	82	289	673	0.13
14000	22000	53	210	459	0.14
13000	20000	81	289	678	0.14
13000	20000	53	213	467	0.14
12000	19000	84	298	702	0.14
12000	19000	53	216	474	0.15
11000	18000	84	302	712	0.15
11000	18000	93	344	739	0.27
10000	17000	113	507	1142	0.27
11000	18000	91	337	724	0.28
9500	16000	110	495	1116	0.28
10000	17000	92	343	737	0.29
9000	15000	111	504	1137	0.29
9500	16000	91	341	735	0.3
8500	14000	109	500	1132	0.3
9000	15000	95	358	774	0.3
8000	13000	112	525	1193	0.3
8500	14000	146	521	1105	0.5
7500	12000	181	757	1673	0.5

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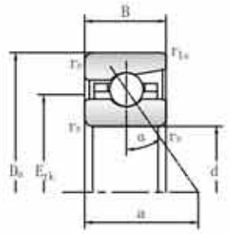
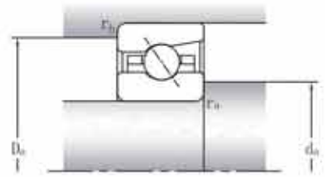
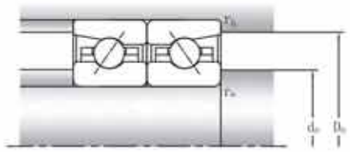
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
718...系列 718... Series







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71824C	120	150	1	0.3	0.1	32	39
71824AC	120	150	1	0.3	0.1	30	36
71826C	130	165	1.1	0.6	0.3	42.5	51
71826AC	130	165	1.1	0.6	0.3	40	48
71828C	140	175	1.1	0.6	0.3	43	54
71828AC	140	175	1.1	0.6	0.3	40.5	51
71830C	150	190	1.1	0.6	0.3	56	69.5
71830AC	150	190	1.1	0.6	0.3	52	64
71832C	160	200	1.1	0.6	0.3	57	73.5
71832AC	160	200	1.1	0.6	0.3	54	68
71834C	170	215	1.1	0.6	0.3	68	88
71834AC	170	215	1.1	0.6	0.3	64	81.5
71836C	180	225	1.1	0.6	0.30	71	93
71836AC	180	225	1.1	0.6	0.30	67	86.5
71838C	190	240	1.5	0.6	0.30	80	108
71838AC	190	240	1.5	0.6	0.30	75	100
71840C	200	250	1.5	0.6	0.3	81.5	114
71840AC	200	250	1.5	0.6	0.3	76.5	106
71844C	220	270	1.5	0.6	0.3	83	118
71844AC	220	270	1.5	0.6	0.3	78	110
71848C	240	300	2	1	0.3	106	150
71848AC	240	300	2	1	0.3	98	140

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	-
r/min		N			Kg
7500	12000	146	527	1119	0.5
7000	11000	184	779	1725	0.5
7000	11000	208	723	1523	0.8
6300	9500	277	1092	2378	0.8
6300	9500	208	728	1536	0.8
6000	9000	275	1097	2397	0.8
6000	9000	281	955	1995	1.1
5300	8000	386	1465	3145	1.1
5600	8500	283	969	2032	1.2
5000	7500	389	1485	3194	1.2
5000	7500	357	1199	2492	1.6
4500	6700	499	1842	3924	1.6
4800	7000	372	1250	2600	1.7
4300	6300	520	1919	4103	1.7
4500	6700	353	1299	2772	2.2
4000	6000	429	1898	4254	2.2
4300	6300	355	1317	2817	2.3
3800	5600	428	1920	4319	2.3
3800	5600	358	1335	2861	2.5
3400	5000	427	1943	4384	2.5
3400	5000	493	1763	3743	3.9
3000	4500	613	2571	5687	3.9

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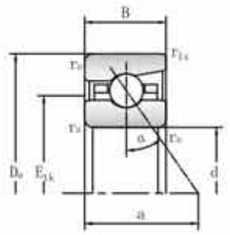
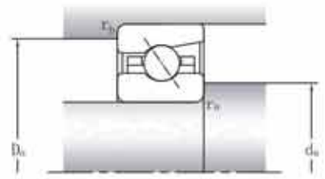
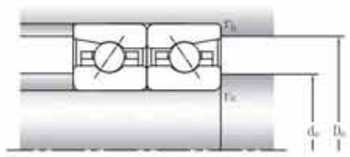
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
719...系列 719... Series







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71900C	10	22	6	0.3	0.1	3	1.53
71900AC	10	22	6	0.3	0.1	2.9	1.46
71901C	12	24	6	0.3	0.3	3.35	1.86
71901AC	12	24	6	0.3	0.3	3.2	1.76
71902C	15	28	7	0.3	0.3	5	2.9
71902AC	15	28	7	0.3	0.3	4.8	2.75
71903C	17	30	7	0.3	0.3	5.3	3.15
71903AC	17	30	7	0.3	0.3	5	3
71904C	20	37	9	0.3	0.3	7.35	4.55
71904AC	20	37	9	0.3	0.3	6.95	4.4
71905C	25	42	9	0.3	0.3	8.15	5.7
71905AC	25	42	9	0.3	0.3	7.8	5.5
71906C	30	47	9	0.3	0.3	8.65	6.55
71906AC	30	47	9	0.3	0.3	8.15	6.3
71907C	35	55	10	0.6	0.6	11.8	9.5
71907AC	35	55	10	0.6	0.6	11	9
71908C	40	62	12	0.6	0.6	17.6	13.7
71908AC	40	62	12	0.6	0.6	16.6	13.2
71909C	45	68	12	0.6	0.6	18.6	15.6
71909AC	45	68	12	0.6	0.6	17.6	15
71910C	50	72	12	0.6	0.6	19	16.6
71910AC	50	72	12	0.6	0.6	18	15.6
71911C	55	80	13	1	1	22.8	20.4
71911AC	55	80	13	1	1	21.6	19.3
71912C	60	85	13	1	1	24	22.8
71912AC	60	85	13	1	1	22.8	21.6
71913C	65	90	13	1	1	24.5	24
71913AC	65	90	13	1	1	22.8	22.4

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	≈
r/min		N			Kg
70000	110000	14	51	114	0.009
63000	95000	17	63	149	0.009
60000	90000	15	56	126	0.01
56000	85000	19	67	162	0.01
50000	75000	20	77	167	0.02
48000	70000	22	112	259	0.02
48000	70000	21	81	176	0.02
43000	63000	23	116	268	0.02
38000	56000	41	137	297	0.03
36000	53000	38	172	390	0.03
32000	48000	40	141	326	0.04
30000	45000	40	189	430	0.04
28000	43000	42	158	345	0.05
26000	40000	40	194	445	0.05
24000	38000	61	209	481	0.07
22000	36000	61	276	619	0.07
22000	36000	85	300	633	0.11
20000	34000	112	450	984	0.11
19000	32000	89	315	667	0.13
18000	30000	116	473	1038	0.13
18000	30000	90	321	679	0.13
16000	26000	118	482	1059	0.13
16000	26000	112	391	825	0.18
15000	24000	149	592	1287	0.18
15000	24000	117	410	866	0.19
14000	22000	156	622	1353	0.19
14000	22000	118	417	883	0.2
13000	20000	153	617	1348	0.2

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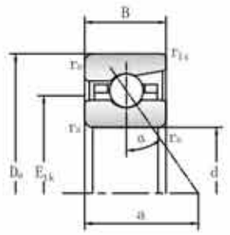
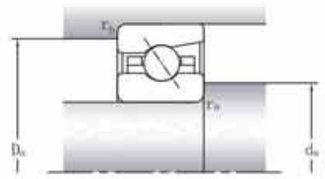
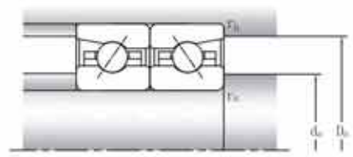
高速精密角接触球轴承
Precision Angular Contact Ball Bearings
719...系列 719... Series







尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71914C	70	100	16	1	1	33.5	32.5
71914AC	70	100	16	1	1	31.5	31
71915C	75	105	16	1	1	34	34.5
71915AC	75	105	16	1	1	32	32.5
71916C	80	110	16	1	1	34.5	36
71916AC	80	110	16	1	1	32.5	34
71917C	85	120	18	1.1	1.1	45	46.5
71917AC	85	120	18	1.1	1.1	42.5	44
71918C	90	125	18	1.10	1.10	45.50	49.00
71918AC	90	125	18	1.10	1.10	43.00	46.50
71919C	95	130	18	1.10	1.10	46.50	51.00
71919AC	95	130	18	1.10	1.10	44.00	48.00
71920C	100	140	20	1.1	1.1	58.5	64
71920AC	100	140	20	1.1	1.1	55	60
71921C	105	145	20	1.1	1.1	58.5	64
71921AC	105	145	20	1.1	1.1	55	60
71922C	110	150	20	1.1	1.1	58.5	67
71922AC	110	150	20	1.1	1.1	56	63
71924C	120	165	22	1.1	1.1	73.5	85
71924AC	120	165	22	1.1	1.1	69.5	80
71926C	130	180	24	1.5	1.5	86.5	100
71926AC	130	180	24	1.5	1.5	81.5	95
71928C	140	190	24	1.5	1.5	90	108
71928AC	140	190	24	1.5	1.5	85	102
71930C	150	210	28	2	1	122	143
71930AC	150	210	28	2	1	114	134
71932C	160	220	28	2	1	125	150
71932AC	160	220	28	2	1	116	140

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	-
r/min		N			Kg
13000	20000	172	588	1230	0.33
12000	19000	234	890	1917	0.33
12000	19000	174	596	1246	0.35
11000	18000	236	901	1943	0.35
12000	19000	175	603	1262	0.37
11000	18000	238	911	1969	0.37
11000	18000	239	804	1672	0.53
9500	16000	336	1232	2631	0.53
10000	17000	240	811	1688	0.55
9000	15000	337	1243	2655	0.55
9500	16000	245	827	1724	0.58
8500	14000	343	1269	2713	0.58
9000	15000	318	1059	2194	0.79
8000	13000	453	1626	3437	0.79
8500	14000	318	1059	2194	0.8
7500	12000	453	1626	3437	0.8
8000	13000	316	1056	2191	0.8
7500	12000	458	1651	3495	0.8
7000	11000	408	1344	2773	1.2
6700	10000	591	2087	4388	1.2
6700	10000	489	1600	3291	1.5
6000	9000	714	2477	5193	1.5
6000	9000	506	1661	3412	1.6
5600	8500	740	2576	5405	1.6
5600	8500	710	2286	4680	2.5
5000	7500	1046	3541	7369	2.5
5000	7500	727	2341	4793	2.7
4800	7000	1061	3597	7491	2.7

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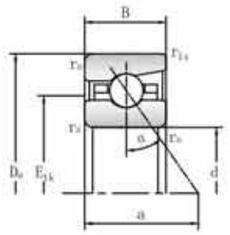
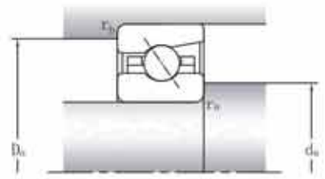
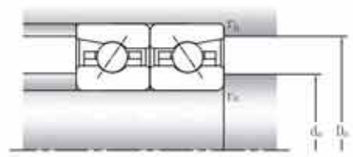
Precision Angular Contact Ball Bearings
719...系列 719... Series







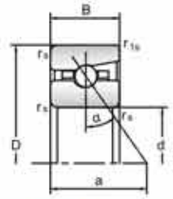
尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					额定载荷 Loading ratings	
	d	D	B	rsmin	r1smin	Cr	Cor
	mm					kN	
71934C	170	230	28	2	1.5	129	163
71934AC	170	230	28	2	1.5	122	150
71936C	180	250	33	2	1	163	204
71936AC	180	250	33	2	1	156	193
71938C	190	260	33	2	1	166	212
71938AC	190	260	33	2	1	156	200
71940C	200	280	38	2.1	1.1	204	255
71940AC	200	280	38	2.1	1.1	193	240
71944C	220	300	38	2.1	1.1	216	285
71944AC	220	300	38	2.1	1.1	204	270
71948C	240	320	38	2.1	1.1	224	310
71948AC	240	320	38	2.1	1.1	212	285
71952C	260	360	46	2.1	1.1	285	415
71952AC	260	360	46	2.1	1.1	270	390
71956C	280	380	46	2.1	1.1	300	450
71956AC	280	380	46	2.1	1.1	280	425
71960C	300	420	56	3	1.1	360	570
71960AC	300	420	56	3	1.1	340	540
71964C	320	440	56	3	1.1	375	620
71964AC	320	440	56	3	1.1	355	585
71968C	340	460	56	3	1.1	380	640
71968AC	340	460	56	3	1.1	360	610
71972C	360	480	56	3	1.1	390	695
71972AC	360	480	56	3	1.1	375	640

极限转速 Attainalbe Spped		预载荷 Preloading Force			重量 Weight
脂Lub.	油Oil	A(轻)	B(中)	C(重)	-
r/min		N			Kg
4800	7000	747	2410	4941	2.8
4500	6700	1111	3777	7870	2.8
4500	6700	966	3086	6300	4.2
4000	6000	1478	4921	10164	4.2
4300	6300	894	2996	6210	4.4
3800	5600	1259	4576	9707	4.4
4000	6000	1133	3734	7704	6.1
3600	5300	1643	5803	12213	6.1
3600	5300	1191	3942	8140	6.7
3200	4800	1714	6084	12867	6.7
3200	4800	1230	4079	8431	7.2
3000	4500	1768	6303	13347	7.2
3000	4500	1625	5291	10870	12.1
2600	4000	2393	8255	17265	12.1
2600	4000	1706	5562	11434	12.9
2400	3800	2463	8534	17870	12.9
2400	3800	2097	6764	13849	20.4
2200	3600	3116	10570	21984	20.4
2200	3600	2177	7017	14413	21.6
2000	3400	3235	11010	22920	21.6
2200	3600	2061	6876	14282	22.7
1900	3200	2930	10616	22515	22.7
2000	3400	2101	7037	14635	23.9
1800	3000	3030	11025	23411	23.9

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not list here, please contact with us.

超高速角接触球轴承
Ultra High-speed Agular contact thrust ball bearings
BNR10系列 BNR10Series α=18°



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定荷载 Load rating		极限轴向负荷 Permissible axial load	E作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	B	r	r_1	Cr	Cor			脂Grease	油Oil	
	mm			min.	min.	N		KN	mm	r/min		Kg
25BNR19S	25	42	9	0.3	0.15	5.95	5.95	4.95	9.9	41800	59800	0.042
25BNR19H	25	42	9	0.3	0.15	5.95	5.95	3.25	9.9	53800	83600	0.038
25BNR19X	25	42	9	0.3	0.15	5.95	5.95	3.25	9.9	62700	98600	0.038
30BNR19S	30	47	9	0.3	0.15	6.3	4.05	5.75	10.8	36400	52000	0.048
30BNR19H	30	47	9	0.3	0.15	6.3	4.05	3.80	10.8	46800	72800	0.043
30BNR19X	30	47	9	0.3	0.15	6.3	4.05	3.80	10.8	54600	85800	0.043
35BNR19S	35	55	10	0.6	0.3	9.20	6.00	8.55	12.3	31200	44500	0.072
35BNR19H	35	55	10	0.6	0.3	9.20	6.00	5.60	12.3	40000	62300	0.063
35BNR19X	35	55	10	0.6	0.3	9.20	6.00	5.60	12.3	46700	73400	0.063
40BNR19S	40	62	12	0.6	0.3	11.5	7.65	10.8	14.3	27500	39300	0.105
40BNR19H	40	62	12	0.6	0.3	11.5	7.65	7.10	14.3	35300	55000	0.092
40BNR19X	40	62	12	0.6	0.3	11.5	7.65	7.10	14.3	41200	64800	0.092
45BNR19S	45	68	12	0.6	0.3	12.1	8.7	12.4	15.2	24800	35400	0.125
45BNR19H	45	68	12	0.6	0.3	12.1	8.7	8.10	15.2	31900	49600	0.111
45BNR19X	45	68	12	0.6	0.3	12.1	8.7	8.10	15.2	37200	58500	0.111
50BNR19S	50	72	12	0.6	0.3	12.8	9.75	13.90	15.9	23000	32800	0.127
50BNR19H	50	72	12	0.6	0.3	12.8	9.75	9.10	15.9	29600	46000	0.111
50BNR19X	50	72	12	0.6	0.3	12.8	9.75	9.10	15.9	34500	54100	0.111
55BNR19S	55	80	13	1.0	0.6	14.4	11.4	16.2	17.5	20800	29700	0.178
55BNR19H	55	80	13	1.0	0.6	14.4	11.4	10.6	17.5	26700	41500	0.158
55BNR19X	55	80	13	1.0	0.6	14.4	11.4	10.6	17.5	31200	48900	0.158
60BNR19S	60	85	13	1.0	0.6	14.6	12	17.1	18.3	19400	27600	0.19
60BNR19H	60	85	13	1.0	0.6	14.6	12	11.2	18.3	24900	38700	0.17
60BNR19X	60	85	13	1.0	0.6	14.6	12	11.2	18.3	29000	45600	0.17
65BNR19S	65	90	13	1.0	0.6	15.2	13.2	18.7	19.1	18100	25900	0.204
65BNR19H	65	90	13	1.0	0.6	15.2	13.2	12.3	19.1	23300	36200	0.181
65BNR19X	65	90	13	1.0	0.6	15.2	13.2	12.3	19.1	27100	42600	0.181
70BNR19S	70	100	16	1.0	0.6	21.3	18.1	26.1	21.8	16500	23600	0.328
70BNR19H	70	100	16	1.0	0.6	21.3	18.1	17.1	21.8	21200	33000	0.292
70BNR19X	70	100	16	1.0	0.6	21.3	18.1	17.1	21.8	24800	38900	0.292

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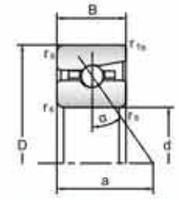
MONTON

超高速角接触球轴承
Ultra High-speed Agular contact thrust ball bearings
BNR19系列 BNR19 Series α=18°



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定荷载 Load rating		极限轴向负荷 Permissible axial load	E作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	B	r	r_1	动载荷 dyn Cr	静载荷 stc Cor			脂Grease	油Oil	
	mm			min.	min.	N		KN	mm	r/min		Kg
75BNR19S	75	105	16	1	0.6	21.6	19.0	27.5	22.6	15600	22300	0.348
75BNR19H	75	105	16	1	0.6	21.6	19.0	18.0	22.6	20000	31200	0.31
75BNR19X	75	105	16	1	0.6	21.6	19.0	18.0	22.6	23400	36700	0.31
80BNR19S	80	110	16	1	0.6	22.0	19.9	28.9	23.4	14800	21100	0.366
80BNR19H	80	110	16	1	0.6	22.0	19.9	18.9	23.4	19000	29500	0.326
80BNR19X	80	110	16	1	0.6	22.0	19.9	18.9	23.4	22200	34800	0.326
85BNR19S	85	120	18	1.1	0.6	29.4	26.3	38.0	25.7	13700	19600	0.527
85BNR19H	85	120	18	1.1	0.6	29.4	26.3	24.8	25.7	17600	27400	0.456
85BNR19X	85	120	18	1.1	0.6	29.4	26.3	24.8	25.7	20500	32200	0.456
90BNR19S	90	125	18	1.1	0.6	31.5	29.7	43.0	26.5	13100	18700	0.552
90BNR19H	90	125	18	1.1	0.6	31.5	29.7	28.1	26.5	16800	26100	0.48
90BNR19X	90	125	18	1.1	0.6	31.5	29.7	28.1	26.5	19600	30700	0.48
95BNR19S	95	130	18	1.1	0.6	32.0	31.0	50.0	28.3	12500	17800	0.571
95BNR19H	95	130	18	1.1	0.6	32.0	31.0	32.5	28.3	16000	24900	0.497
95BNR19X	95	130	18	1.1	0.6	32.0	31.0	32.5	28.3	18700	29400	0.497
100BNR19S	100	140	20	1.1	0.6	38.0	35.0	50.5	29.5	11700	16700	0.77
100BNR19H	100	140	20	1.1	0.6	38.0	35.0	33.0	29.5	15000	23400	0.673
100BNR19X	100	140	20	1.1	0.6	38.0	35.0	33.0	29.5	17500	27500	0.673
105BNR19S	105	145	20	1.1	0.6	38.5	36.5	53.0	31.5	11200	16000	0.795
105BNR19H	105	145	20	1.1	0.6	38.5	36.5	39.0	31.5	14400	22400	0.693
105BNR19X	105	145	20	1.1	0.6	38.5	36.5	39.0	31.5	16800	26400	0.693
110BNR19S	110	150	20	1.1	0.6	39.0	38.0	55.5	31.1	10800	15400	0.838
110BNR19H	110	150	20	1.1	0.6	39.0	38.0	42.0	31.1	13900	21600	0.733
110BNR19X	110	150	20	1.1	0.6	39.0	38.0	42.0	31.1	16200	25400	0.733
120BNR19S	120	165	22	1.1	0.6	54.0	52.0	75.0	34.2	9900	14100	1.124
120BNR19H	120	165	22	1.1	0.6	54.0	52.0	49.0	34.2	12700	19700	0.949
120BNR19X	120	165	22	1.1	0.6	54.0	52.0	49.0	34.2	14800	23200	0.949
130BNR19S	130	180	24	1.5	1.0	59.5	58.5	85.0	37.2	9100	13000	1.477
130BNR19H	130	180	24	1.5	1.0	59.5	58.5	56.0	37.2	11700	18100	1.265
140BNR19S	140	190	24	1.5	1.0	60.0	61.5	89.5	38.8	8500	12200	1.567
140BNR19H	140	190	24	1.5	1.0	60.0	61.5	58.5	38.8	11000	17000	1.353
150BNR19S	150	210	28	2.0	1.0	77.0	78.5	114	43.2	7800	11200	2.459
150BNR19H	150	210	28	2.0	1.0	77.0	78.5	75.0	43.2	10000	15600	2.139

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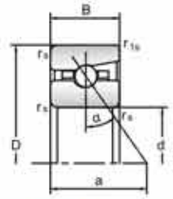
超高速角接触球轴承
Ultra High-speed Agular contact thrust ball bearings
BNR10系列 BNR10Series α=18°



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定荷载 Load rating		极限轴向负荷 Permissible axial load	E作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	B	r	r_1	Cr	Cor			脂Grease	油Oil	
	mm			min.	min.	N		KN	mm	r/min		Kg
30BNR10S	30	55	13	1.0	0.6	8.65	5.75	8.20	13.3	33000	47100	0.124
30BNR10H	30	55	13	1.0	0.6	8.65	5.75	5.35	13.3	42400	65900	0.116
30BNR10X	30	55	13	1.0	0.6	8.65	5.75	5.35	13.3	49500	77700	0.116
35BNR10S	35	62	14	1.0	0.6	10.1	7.1	10.2	14.8	28900	41300	0.164
35BNR10H	35	62	14	1.0	0.6	10.1	7.1	6.7	14.8	37200	57800	0.154
35BNR10X	35	62	14	1.0	0.6	10.1	7.1	6.7	14.8	43300	68100	0.154
40BNR10S	40	68	15	1.0	0.6	10.6	7.95	11.5	16.2	26000	37100	0.204
40BNR10H	40	68	15	1.0	0.6	10.6	7.95	7.5	16.2	33400	51900	0.193
40BNR10X	40	68	15	1.0	0.6	10.6	7.95	7.5	16.2	38900	61200	0.193
45BNR10S	45	75	16	1.0	0.6	11.7	9.0	12.7	17.6	23400	33400	0.259
45BNR10H	45	75	16	1.0	0.6	11.7	9.0	8.35	17.6	30000	46700	0.246
45BNR10X	45	75	16	1.0	0.6	11.7	9.0	8.35	17.6	35000	55000	0.246
50BNR10S	50	80	16	1.0	0.6	12.2	9.9	14.0	18.4	21600	30800	0.281
50BNR10H	50	80	16	1.0	0.6	12.2	9.9	9.2	18.4	27700	43100	0.266
50BNR10X	50	80	16	1.0	0.6	12.2	9.9	9.2	18.4	32400	50800	0.266
55BNR10S	55	90	18	1.1	0.6	15.1	12.5	17.8	20.6	19400	27600	0.414
55BNR10H	55	90	18	1.1	0.6	15.1	12.5	11.7	20.6	24900	38700	0.393
55BNR10X	55	90	18	1.1	0.6	15.1	12.5	11.7	20.6	29000	45600	0.393
60BNR10S	60	95	18	1.1	0.6	15.6	13.7	19.5	21.5	18100	25900	0.443
60BNR10H	60	95	18	1.1	0.6	15.6	13.7	12.8	21.5	23300	36200	0.419
60BNR10X	60	95	18	1.1	0.6	15.6	13.7	12.8	21.5	27100	42600	0.419
65BNR10S	65	100	18	1.1	0.6	16.2	14.8	21.1	22.3	17000	24300	0.472
65BNR10H	65	100	18	1.1	0.6	16.2	14.8	13.9	22.3	21900	34000	0.447
65BNR10X	65	100	18	1.1	0.6	16.2	14.8	13.9	22.3	25500	40000	0.447
70BNR10S	70	110	20	1.1	0.6	22.3	19.8	28.6	24.5	15600	22300	0.645
70BNR10H	70	110	20	1.1	0.6	22.3	19.8	18.8	24.5	20000	31200	0.605
70BNR10X	70	110	20	1.1	0.6	22.3	19.8	18.8	24.5	23400	36700	0.605
75BNR10S	75	115	20	1.1	0.6	22.6	20.7	30.0	25.3	14800	21100	0.679
75BNR10H	75	115	20	1.1	0.6	22.6	20.7	19.7	25.3	19000	29500	0.638
75BNR10X	75	115	20	1.1	0.6	22.6	20.7	19.7	25.3	22200	34800	0.638

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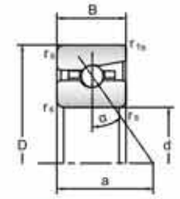
超高速角接触球轴承
Ultra High-speed Agular contact thrust ball bearings
BNR10系列 BNR10 Series α=18°



尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定荷载 Load rating		极限轴向负荷 Permissible axial load	E作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	B	r	r_1	动载荷 dyn Cr	静载荷 stic Cor			脂Grease	油Oil	
	mm			min.	min.	N		KN	mm	r/min		Kg
80BNR10S	80	125	22	1.1	0.6	26.5	24.5	35.5	27.5	13700	19600	0.921
80BNR10H	80	125	22	1.1	0.6	26.5	24.5	23.4	27.5	17600	27400	0.867
80BNR10X	80	125	22	1.1	0.6	26.5	24.5	23.4	27.5	20500	32200	0.867
85BNR10S	85	130	22	1.1	0.6	26.8	25.7	37.5	28.4	13100	18700	0.962
85BNR10H	85	130	22	1.1	0.6	26.8	25.7	24.5	28.4	16800	26100	0.906
85BNR10X	85	130	22	1.1	0.6	26.8	25.7	24.5	28.4	19600	30700	0.906
90BNR10S	90	140	24	1.5	1.0	35.0	33.0	48.0	30.7	12200	17400	1.241
90BNR10H	90	140	24	1.5	1.0	35.0	33.0	31.5	30.7	15700	24400	1.155
90BNR10X	90	140	24	1.5	1.0	35.0	33.0	31.5	30.7	18300	28700	1.155
95BNR10S	95	145	24	1.5	1.0	35.5	34.5	50.0	31.3	11700	16700	1.298
95BNR10H	95	145	24	1.5	1.0	35.5	34.5	32.5	31.3	15000	23400	1.209
95BNR10X	95	145	24	1.5	1.0	35.5	34.5	32.5	31.3	17500	27500	1.209
100BNR10S	100	150	24	1.5	1.0	36.0	36.0	52.0	32.3	11200	16000	1.245
100BNR10H	100	150	24	1.5	1.0	36.0	36.0	34.0	32.3	14400	22400	1.253
100BNR10X	100	150	24	1.5	1.0	36.0	36.0	34.0	32.3	16800	26400	1.253
105BNR10S	105	160	26	2.0	1.0	41.0	41.0	59.5	34.5	10600	15100	1.698
105BNR10H	105	160	26	2.0	1.0	41.0	41.0	39.0	34.5	13600	21200	1.585
105BNR10X	105	160	26	2.0	1.0	41.0	41.0	39.0	34.5	15900	25000	1.585
110BNR10S	110	170	28	2.0	1.0	46.0	47.0	68.0	36.7	10000	14300	2.133
110BNR10H	110	170	28	2.0	1.0	46.0	47.0	44.5	36.7	12900	20000	1.996
110BNR10X	110	170	28	2.0	1.0	46.0	47.0	44.5	36.7	15000	23600	1.996
120BNR10S	120	180	28	2.0	1.0	47.5	50.5	73.5	38.4	9400	13400	2.286
120BNR10H	120	180	28	2.0	1.0	47.5	50.5	48.0	38.4	12000	18700	2.139
120BNR10X	120	180	28	2.0	1.0	47.5	50.5	48.0	38.4	14000	22000	2.139
130BNR10S	130	200	33	2.0	1.0	60	61.5	89.5	43.0	8500	12200	3.408
130BNR10H	130	200	33	2.0	1.0	60	61.5	58.5	43.0	11000	17000	3.194
140BNR10S	140	210	33	2.0	1.0	62.5	66.5	97.0	44.6	8000	11500	3.647
140BNR10H	140	210	33	2.0	1.0	62.5	66.5	63.5	44.6	10300	16000	3.419
150BNR10S	150	225	35	2.1	1.0	73.5	78.0	114.0	47.6	7500	10700	4.405
150BNR10H	150	225	35	2.1	1.0	73.5	78.0	74.5	47.6	9600	15000	4.129

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双向推力角接触球轴承
Double Direction Angular Contact Ball Bearings

MONTON

● Double Direction Angular Contact Ball Bearings

代号例 Bearings designation system:

23	44	08	M	SP

轴承类型代号
Bearings designation

23 – 双向推力角接触球轴承
接触角60°
23– Double Direction Angular Contact Ball Bearings Contact angle 60°

尺寸系列代号
Dimension series

2344 – 与NN30K锥孔小端轴组配
2344 –For mounting at NN30K small–end taper
2347 – 与NN30K锥孔大端轴组配
2347– For mounting at NN30Klarge–end taper

内径代号
Bore Diameter

08 — 8 x 5 = 40mm　16 — 16 x 5 = 80mm
47系列的内径尺寸不同于44系列，应在尺寸表中查找。
47 series inner diameter different from 44 series,dimension can check out from tables.

公差等级代号
Precision degree

SP – GB/T6362 – 1995
SP级
UP – GB/T6362 – 1995
UP级

保持架材料代号
Cage material

M – 黄铜实体保持架
M– brass cage

● High Speed Angular Contact Ball Bearings

80	BAR	10	H	TYN	DBB	EL	P4

公称轴承内径
Bore Diameter

80 内径尺寸 Bore diameter

轴承形式记号
Bearing type

BAR: 30° 接触角
BAR:30° contact angle
BTR: 40° 接触角
BTR:40° contact angle

尺寸系列记号 Dimension

10:内径尺寸外径尺寸10系列
10: bore&outer dimension 10 series

类型记号 Material

S: 轴承钢 (SUJ2)
H: 陶瓷球 (Si_3N_4)
S: Bearings steel (SUJ2)
H: Ceramic ball (Si_3N_4)

精度记号
Accuracy

P4: ISO P4级
P2: ISO P2级
P4: ISO Clas P4
P2: ISO Clas P2

预紧记号 Preload

EL : 微预紧
L: 轻预紧
CP: 特殊预紧
EL : extra preload
L: light preload
CP: special load

组合记号 Arrangement

DB: 背对背组合
DB: back to back arrangement

保持架记号 Cage

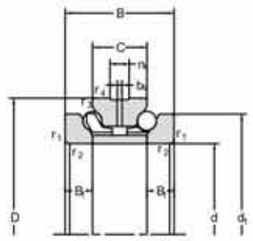
TYN: 滚动体引导聚酰胺树脂保持架
TYN: ball guided polyamide resin cage

MONTON

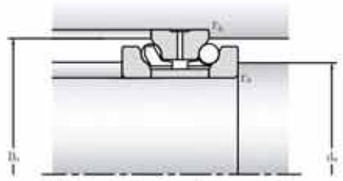
双向推力角接触球轴承

Double Direction Angular Contact Ball Bearings

接触角 α=60° Contact angle α=60°



2344，2347
α=60°



安装尺寸 Abutment dimensions

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	质量 Weight m' ≈kg	d	D	B	C	d_1	B_1	r min.	r_1 min.	d_2	n_1
234406M	0.29	30	55	32	16	47	8.0	1.0	0.15	3.2	4.8
234706M	0.27	32	55	32	16	47	8.0	1.0	0.15	3.2	4.8
234407M	0.38	35	62	34	17	53	8.5	1.0	0.15	3.2	4.8
234707M	0.35	37	62	34	17	53	8.5	1.0	0.15	3.2	4.8
234408M	0.46	40	68	36	18	58.5	9.0	1.0	0.15	3.2	4.8
234708M	0.43	42	68	36	18	58.5	9.0	1.0	0.15	3.2	4.8
234409M	0.58	45	75	38	19	65	9.5	1.0	0.15	3.2	4.8
234709M	0.54	47	75	38	19	65	9.5	1.0	0.15	3.2	4.8
234410M	0.63	50	80	38	19	70	9.5	1.0	0.15	3.2	4.8
234710M	0.58	52	80	38	19	70	9.5	1.0	0.15	3.2	4.8
234411M	0.94	55	90	44	22	78	11.0	1.1	0.3	3.2	6.5
234711M	0.88	57	90	44	22	78	11.0	1.1	0.3	3.2	6.5
234412M	1.01	60	95	44	22	83	11.0	1.1	0.3	3.2	6.5
234712M	0.94	62	95	44	22	83	11.0	1.1	0.3	3.2	6.5
234413M	1.08	65	100	44	22	88	11.0	1.1	0.3	3.2	6.5
234713M	1.01	67	100	44	22	88	11.0	1.1	0.3	3.2	6.5
234414M	1.49	70	110	48	24	97	12.0	1.1	0.3	3.2	6.5
234714M	1.36	73	110	48	24	97	12.0	1.1	0.3	3.2	6.5
234415M	1.57	75	115	48	24	102	12.0	1.1	0.3	3.2	6.5
234715M	1.43	78	115	48	24	102	12.0	1.1	0.3	3.2	6.5
234416M	2.16	80	125	54	27	110	13.5	1.1	0.3	3.2	6.5
234716M	1.98	83	125	54	27	110	13.5	1.1	0.3	3.2	6.5
234417M	2.25	85	130	54	27	115	13.5	1.1	0.3	4.8	9.5
234717M	2.07	88	130	54	27	115	13.5	1.1	0.3	4.8	9.5
234418M	2.92	90	140	60	30	123	15.0	1.5	0.3	4.8	9.5
234718M	2.71	93	140	60	30	123	15.0	1.5	0.3	4.8	9.5
234419M	3.04	95	145	60	30	128	15.0	1.5	0.3	4.8	9.5
234719M	2.83	98	145	60	30	128	15.0	1.5	0.3	4.8	9.5
234420M	3.17	100	150	60	30	133	15.0	1.5	0.3	4.8	9.5
234720M	2.95	103	150	60	30	133	15.0	1.5	0.3	4.8	9.5

安装尺寸 Abutment Dimensions				基本额定荷载 Load rating		极限转速 Attainalbe Speed		预紧力 Preloading force	卸载力[2] Unloading force	轴向刚度[3] Rigidity force
da h12	Da H12	R_a max.	r_{a1} max.	动载荷 dyn C_aN	静载荷 sta C_{0a}N	n_1脂 Grease min^{-1}	n_0油[1] Oil min^{-1}	F_vN	K_vN	S_vN/μm
40.5	50.5	1.0	0.15	15300	36000	11000	16000	108	308	276
40.5	50.5	1.0	0.15	15300	36000	11000	16000	108	308	276
46.5	57.0	1.0	0.15	18900	47000	9500	14000	134	382	316
46.5	57.0	1.0	0.15	18900	47000	9500	14000	134	382	316
51.5	63.5	1.0	0.15	22900	59000	8500	12000	160	456	354
51.5	63.5	1.0	0.15	22900	59000	8500	12000	160	456	354
57.5	70.0	1.0	0.15	25000	67000	7500	10000	180	514	387
57.5	70.0	1.0	0.15	25000	67000	7500	10000	180	514	387
62.5	75.0	1.0	0.15	26000	72000	7000	9500	183	522	410
62.5	75.0	1.0	0.15	26000	72000	7000	9500	183	522	410
69.0	84.5	1.1	0.3	36500	99000	6300	8500	260	743	458
69.0	84.5	1.1	0.3	36500	99000	6300	8500	260	743	458
74.0	89.5	1.1	0.3	36000	98000	6000	8000	255	728	455
74.0	89.5	1.1	0.3	36000	98000	6000	8000	255	728	455
79.0	94.5	1.1	0.3	38500	111000	5600	7500	275	785	506
79.0	94.5	1.1	0.3	38500	111000	5600	7500	275	785	506
86.5	103.5	1.1	0.3	46000	134000	5300	7000	325	926	552
86.5	103.5	1.1	0.3	46000	134000	5300	7000	325	926	552
91.5	108.5	1.1	0.3	47500	144000	5000	6700	340	969	589
91.5	108.5	1.1	0.3	47500	144000	5000	6700	340	969	589
98.5	117.0	1.1	0.3	56000	175000	4500	6000	400	1140	640
98.5	117.0	1.1	0.3	56000	175000	4500	6000	400	1140	640
103.5	122.0	1.1	0.3	57000	181000	4500	6000	400	1140	655
103.5	122.0	1.1	0.3	57000	181000	4500	6000	400	1140	655
110.5	130.5	1.5	0.3	66000	213000	4000	5300	465	1326	708
110.5	130.5	1.5	0.3	66000	213000	4000	5300	465	1326	708
115.5	135.5	1.5	0.3	66000	219000	4000	5300	465	1326	724
115.5	135.5	1.5	0.3	66000	219000	4000	5300	465	1326	724
120.5	140.5	1.5	0.3	67000	226000	3800	5000	685	1956	843
120.5	140.5	1.5	0.3	67000	226000	3800	5000	685	1956	843

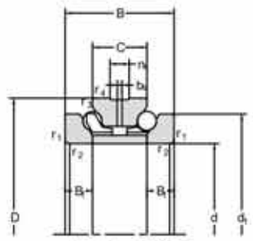
注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

MONTON

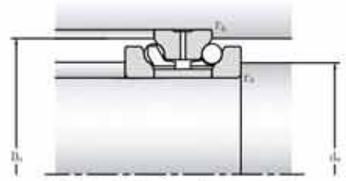
双向推力角接触球轴承

Double Direction Angular Contact Ball Bearings

接触角 α=60° Contact angle α=60°



2344，2347
α=60°



安装尺寸 Abutment dimensions

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	质量 Weight m' ≈kg	d	D	B	C	d_1	B_1	r min.	r_1 min.	d_c	n_1
234421M	4.07	105	160	66	33	142	16.5	2.0	0.6	4.8	9.5
234721M	3.73	109	160	66	33	142	16.5	2.0	0.6	4.8	9.5
234422M	5.19	110	170	72	36	150	18	2.0	0.6	4.8	9.5
234722M	4.79	114	170	72	36	150	18	2.0	0.6	4.8	9.5
234424M	5.56	120	180	72	36	160	18	2.0	0.6	4.8	9.5
234724M	5.14	124	180	72	36	160	18	2.0	0.6	4.8	9.5
234426M	8.28	130	200	84	42	177	21	2.0	0.6	6.3	12.2
234726M	7.58	135	200	84	42	177	21	2.0	0.6	6.3	12.2
234428M	8.78	140	210	84	42	187	21	2.1	0.6	6.3	12.2
234728M	8.07	145	210	84	42	187	21	2.1	0.6	6.3	12.2
234430M	10.8	150	225	90	45	200	22.5	2.1	0.6	8.0	15
234730M	9.95	155	225	90	45	200	22.5	2.1	0.6	8.0	15
234432M	12.9	160	240	96	48	212	24	2.1	0.6	8.0	15
234732M	12	165	240	96	48	212	24	2.1	0.6	8.0	15
234434M	17.7	170	260	108	54	230	27	2.1	0.6	8.0	15
234734M	16.3	176	260	108	54	230	27	2.1	0.6	8.0	15
234436M	23.4	180	280	120	60	248	30	2.1	0.6	8.0	15
234736M	21.5	187	280	120	60	248	30	2.1	0.6	8.0	15
234438M	24.7	190	290	120	60	258	30	2.1	0.6	8.0	15
234738M	22.6	197	290	120	60	258	30	2.1	0.6	8.0	15
234440M	31.5	200	310	132	66	274	33	2.1	8.0	8.0	15
234740M	29.2	207	310	132	66	274	33	2.1	8.0	8.0	15
234444M	41.7	220	340	144	72	304	36	3.0	9.5	9.5	17.7
234744M	38.5	228	340	144	72	304	36	3.0	9.5	9.5	17.7
234448M	43.8	240	360	144	72	322	36	3.0	9.5	9.5	17.7
234748M	40.4	248	360	144	72	322	36	3.0	9.5	9.5	17.7
234452M	64.5	260	400	164	82	354	41	4.0	9.5	9.5	17.7
234752M	59.7	269	400	164	82	354	41	4.0	9.5	9.5	17.7
234456M	69	280	420	164	82	374	41	4.0	9.5	9.5	17.7
234756M	63.8	289	420	164	82	374	41	4.0	9.5	9.5	17.7

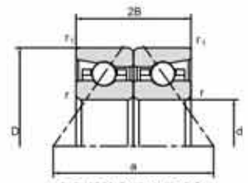
注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

安装尺寸 Abutment Dimensions				基本额定荷载 Load rating		极限转速 Attainalbe Speed		预紧力 Preloading force	卸载力[2] Unloading force	轴向刚度[3] Rigidity force
da h12	Da H12	R_a max.	r_{a1} max.	动载荷 dyn C_aN	静载荷 sta C_{0a}N	n_1脂 Grease min^{-1}	n_0油[1] Oil min^{-1}	F_vN	K_vN	S_vN/μm
128	150	2.0	0.6	74000	250000	3600	4800	530	1511	775
128	150	2.0	0.6	74000	250000	3600	4800	530	1511	775
134.5	160	2.0	0.6	98000	325000	3400	4500	695	1983	853
134.5	160	2.0	0.6	98000	325000	3400	4500	695	1983	853
144.5	170	2.0	0.6	101000	345000	3200	4300	960	2736	996
144.5	170	2.0	0.6	101000	345000	3200	4300	960	2736	996
159	188	2.0	0.6	128000	440000	2800	3800	900	2570	978
159	188	2.0	0.6	128000	440000	2800	3800	900	2570	978
169	198	2.1	0.6	132000	470000	2600	3600	930	2649	1034
169	198	2.1	0.6	132000	470000	2600	3600	930	2649	1034
181	211.5	2.1	0.6	142000	520000	2600	3600	1320	3764	1183
181	211.5	2.1	0.6	142000	520000	2600	3600	1320	3764	1183
192.5	226	2.1	0.6	168000	600000	2400	3400	1180	3362	1149
192.5	226	2.1	0.6	168000	600000	2400	3400	1180	3362	1149
206.5	245	2.1	0.6	207000	740000	2200	3200	1847	5270	1362
206.5	245	2.1	0.6	207000	740000	2200	3200	1847	5270	1362
221	263	2.1	0.6	235000	840000	2000	3000	1660	4733	1315
221	263	2.1	0.6	235000	840000	2000	3000	1660	4733	1315
231	273	2.1	0.6	244000	900000	1900	2800	2110	6021	1495
231	273	2.1	0.6	244000	900000	1900	2800	2110	6021	1495
245	291.5	2.1	0.6	285000	1060000	1800	2600	2600	5704	1449
245	291.5	2.1	0.6	285000	1060000	1800	2600	2600	5704	1449
269	318	3.0	1.1	340000	1330000	1600	2200	2200	6848	1629
269	318	3.0	1.1	340000	1330000	1600	2200	2200	6848	1629
289	338	3.00	1.1	350000	1420000	1500	2000	2000	7134	1729
289	338	3.0	1.1	350000	1420000	1500	2000	2000	7134	1729
317.5	374.5	4.0	1.5	400000	1680000	1400	1900	1900	8257	1814
317.5	374.5	4.0	1.5	400000	1680000	1400	1900	1900	8257	1814
337.5	394.5	4.0	1.5	415000	1790000	1300	1800	1800	8542	1920
337.5	394.5	4.0	1.5	415000	1790000	1300	1800	1800	8542	1920

高速推力角接触球轴承
High-speed Agular contact thrust ball bearings

BAR10系列 BAR10 Series α=30°

BTR10系列 BTR10 Series α=40°



BTR10 BAR10

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定载荷 Basic loading ratings		极限轴向负荷 Permissible axial load	作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	2B	r	r_1					脂Grease	油Oil	
	mm			min.	min.	KN		KN	mm	r/min		Kg
50BAR10S	50	80	28.5	1.0	0.6	14.7	27.7	18.4	25.7	11600	14700	0.272
50BAR10H	50	80	28.5	1.0	0.6	14.7	27.7	12.6	25.7	13100	16200	0.257
50BTR10S	50	80	28.5	1.0	0.6	17.4	31.5	21.5	34.1	10000	13100	0.272
50BTR10H	50	80	28.5	1.0	0.6	17.4	31.5	15.5	34.1	11600	14700	0.257
55BAR10S	55	90	33.0	1.1	0.6	18.2	35.0	23.4	28.9	10400	13200	0.412
55BAR10H	55	90	33.0	1.1	0.6	18.2	35.0	16.0	28.9	11800	14500	0.391
55BTR10S	55	90	33.0	1.1	0.6	21.6	40.0	26.4	38.3	9000	11800	0.412
55BTR10H	55	90	33.0	1.1	0.6	21.6	40.0	19.7	38.3	10400	13200	0.391
60BAR10S	60	95	33.0	1.1	0.6	18.9	38.0	25.5	30.4	9700	12300	0.420
60BAR10H	60	95	33.0	1.1	0.6	18.9	38.0	17.5	30.4	11000	13600	0.397
60BTR10S	60	95	33.0	1.1	0.6	22.4	43.5	25.8	40.4	8400	11000	0.420
60BTR10H	60	95	33.0	1.1	0.6	22.4	43.5	21.5	40.4	9700	12300	0.397
65BAR10S	65	100	33.0	1.1	0.6	19.5	41.5	27.7	31.8	9100	11600	0.447
65BAR10H	65	100	33.0	1.1	0.6	19.5	41.5	19.0	31.8	10400	12800	0.406
65BTR10S	65	100	33.0	1.1	0.6	23.1	47.0	27.3	42.5	7900	10400	0.447
65BTR10H	65	100	33.0	1.1	0.6	23.1	47.0	23.3	42.5	9100	11600	0.406
70BAR10S	70	110	36.0	1.1	0.6	26.9	55.0	37.5	34.7	8400	10600	0.601
70BAR10H	70	110	36.0	1.1	0.6	26.9	55.0	25.5	34.7	9500	11700	0.561
70BTR10S	70	110	36.0	1.1	0.6	32.0	63.0	35.0	46.3	7300	9500	0.601
70BTR10H	70	110	36.0	1.1	0.6	32.0	63.0	31.5	46.3	8400	10600	0.561
75BAR10S	75	115	36.0	1.1	0.6	27.3	58.0	39.0	36.1	7900	10000	0.634
75BAR10H	75	115	36.0	1.1	0.6	27.3	58.0	26.7	36.1	9000	11100	0.592
75BTR10S	75	115	36.0	1.1	0.6	32.5	65.5	36.5	48.4	6900	9000	0.634
75BTR10H	75	115	36.0	1.1	0.6	32.5	65.5	33.0	48.4	7900	10000	0.592
80BAR10S	80	125	40.5	1.1	0.6	32.0	68.5	46.5	39.4	7400	9300	0.875
80BAR10H	80	125	40.5	1.1	0.6	32.0	68.5	32.0	39.4	8300	10300	0.821
80BTR10S	80	125	40.5	1.1	0.6	38.0	78.0	43.0	52.7	6400	8300	0.875
80BTR10H	80	125	40.5	1.1	0.6	38.0	78.0	39.0	52.7	7400	9300	0.821
85BAR10S	85	130	40.5	1.1	0.6	32.5	71.5	48.5	41.1	7000	8900	0.971
85BAR10H	85	130	40.5	1.1	0.6	32.5	71.5	33.0	41.1	8000	9800	0.915
85BTR10S	85	130	40.5	1.1	0.6	38.5	81.5	50.5	55.2	6100	8000	0.971
85BTR10H	85	130	40.5	1.1	0.6	38.5	81.5	41.0	55.2	7000	8900	0.915
90BAR10S	90	140	45.0	1.5	1.0	42.5	92.5	62.5	44.4	6600	8300	1.198
90BAR10H	90	140	45.0	1.5	1.0	42.5	92.5	43.0	44.4	7400	9200	1.124
90BTR10S	90	140	45.0	1.5	1.0	50.0	105.0	58.0	59.5	5700	7400	1.198
90BTR10H	90	140	45.0	1.5	1.0	50.0	105.0	52.5	59.5	6600	8300	1.124

注：若需要本尺寸表中未列入的轴承，请于我们联系。
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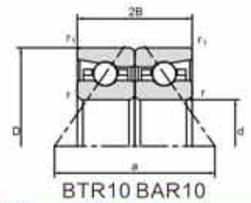
MONTON

高速推力角接触球轴承
High-speed Agular contact thrust ball bearings

BAR10系列 BAR10 Series α=30°

BTR10系列 BTR10 Series α=40°



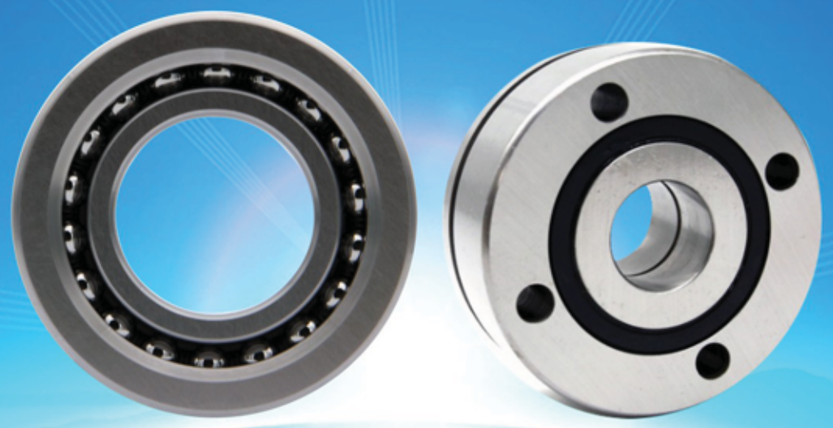
BTR10 BAR10

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	尺寸 Demension					基本额定载荷 Basic loading ratings		极限轴向负荷 Permissible axial load	作用点位置 Effective load center	极限转速 Attainalbe Spped		重量 Weight
	d	D	2B	r	r_1					脂Grease	油Oil	
	mm			min.	min.	KN		KN	mm	r/min		Kg
95BAR10S	95	145	45.0	1.5	1.0	43.0	96.5	65.0	45.5	6300	8000	1.320
95BAR10H	95	145	45.0	1.5	1.0	43.0	96.5	44.5	45.5	7100	8800	1.231
95BTR10S	95	145	45.0	1.5	1.0	51.0	110.0	69.0	61.0	5500	7100	1.320
95BTR10H	95	145	45.0	1.5	1.0	51.0	110.0	55.0	61.0	6300	8000	1.231
100BAR10S	100	150	45.0	1.5	1.0	43.5	100.0	68.0	47.3	6000	7600	1.399
100BAR10H	100	150	45.0	1.5	1.0	43.5	100.0	46.5	47.3	6800	8400	1.307
100BTR10S	100	150	45.0	1.5	1.0	51.5	114.0	66.5	63.7	5200	6800	1.399
100BTR10H	100	150	45.0	1.5	1.0	51.5	114.0	57.0	63.7	6000	7600	1.307
105BAR10S	105	160	49.5	2.0	1.0	49.5	115.0	78.0	50.6	5700	7200	1.740
105BAR10H	105	160	49.5	2.0	1.0	49.5	115.0	53.5	50.6	6500	8000	1.624
105BTR10S	105	160	49.5	2.0	1.0	58.5	131.0	84.0	68.0	5000	6500	1.740
105BTR10H	105	160	49.5	2.0	1.0	58.5	131.0	65.5	68.0	5700	7200	1.624
110BAR10S	110	170	54.0	2.0	1.0	55.5	131.0	89.0	53.9	5400	6800	2.11
110BAR10H	110	170	54.0	2.0	1.0	55.5	131.0	60.5	53.9	6100	7500	1.972
110BTR10S	110	170	54.0	2.0	1.0	66.0	148.0	82.5	72.2	4700	6100	2.110
110BTR10H	110	170	54.0	2.0	1.0	66.0	148.0	74.5	72.2	5400	6800	1.972
120BAR10S	120	180	54.0	2.0	1.0	57.0	141.0	96.0	56.8	5000	6400	2.262
120BAR10H	120	180	54.0	2.0	1.0	57.0	141.0	65.5	56.8	5700	7000	2.114
120BTR10S	120	180	54.0	2.0	1.0	68.0	160.0	88.5	76.4	4400	5700	2.262
120BTR10H	120	180	54.0	2.0	1.0	68.0	160.0	80.5	76.4	5000	6400	2.114
130BAR10S	130	200	63.0	2.0	1.0	72.5	172.0	117.0	63.4	4600	5800	3.362
130BAR10H	130	200	63.0	2.0	1.0	72.5	172.0	79.5	63.4	5200	6400	3.148
130BTR10S	130	200	63.0	2.0	1.0	86.0	195.0	106.0	85.0	4000	5200	3.362
130BTR10H	130	200	63.0	2.0	1.0	86.0	195.0	98.0	85.0	4600	5800	3.148
140BAR10S	140	210	63.0	2.0	1.0	78.5	200.0	135.0	66.2	4300	5500	3.558
140BTR10S	140	210	63.0	2.0	1.0	93.0	227.0	84.0	89.1	3800	4900	3.558
150BAR10S	150	225	67.5	2.1	1.1	92.5	234.0	160.0	71.0	4000	5100	4.354
150BTR10S	150	225	67.5	2.1	1.1	110.0	267.0	165.0	95.5	3500	4600	4.354
160BAR10S	160	240	72.0	2.1	1.1	98.5	250.0	104.0	75.7	3800	4800	5.640
160BTR10S	160	240	72.0	2.1	1.1	117.0	284.0	184.0	101.9	3300	4300	5.640
170BAR10S	170	260	81.0	2.1	1.1	115.0	295.0	207.0	82.3	3500	4500	7.900
170BTR10S	170	260	81.0	2.1	1.1	136.0	335.0	220.0	110.5	3100	4000	7.900
180BAR10S	180	280	90.0	2.1	1.1	151.0	385.0	262.0	88.8	3300	4200	10.200
180BTR10S	180	280	90.0	2.1	1.1	179.0	440.0	255.0	118.9	2900	3700	10.200
190BAR10S	190	290	90.0	2.1	1.1	151.0	390.0	273.0	91.8	3200	4000	10.700
190BTR10S	190	290	90.0	2.1	1.1	179.0	445.0	281.0	123.2	2800	3600	10.700
200BAR10S	200	310	99.0	2.1	1.1	169.0	444.0	300.0	98.3	3000	3800	13.800
200BTR10S	200	310	99.0	2.1	1.1	201.0	505.0	310.0	131.7	2600	3400	13.800

注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not Isit here, please contact with us for details.

丝杠用推力角接触球轴承
Precision Ball Screw Support Bearings



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● Precision Ball Screw Support Bearings

代号例 Bearings Designation system :

76 | 03 | 020 | TVP | P4 | QBC

轴承类型代号
Bearings Designations

76 – 丝杠用推力角接触球轴承
76–Ball Screw Support Bearings

接触角为60°
Contact angle 60°

尺寸系列代号
Dimension series

03、02 – 分别表示按行业标准
03 、02 – Standard diameter series

内径尺寸代号
Bore Diameter

020 – 内径尺寸20mm
020 – inner diameter 20mm

保持架材料代号
Cage Material

TVP – 表用玻璃纤维增强的尼龙66塑料注射成形的保持架
TVP - PA66 polyamide cage, ball-centered

公差等级代号
Precision degree

P4、P2 – 分别代表轴承采用国际
P4、P2 – ISO stdandrad

配对组合方式代号
Bearings Arrangement

组配方式：DB、DF、DT、TT、QBC、QFC
Arrangment：DB、DF、DT、TT、QBC and QFC

滚珠丝杠支撑轴承是一种高精度角接触推力球轴承(接触角60°)，高速、高轴向刚度、低摩擦、长寿命和瞬态高低速转换。滚珠丝杠轴承特别的适用于高速精密数控机床中滚珠丝杠及类似传动部件的支撑。

Ball screw support bearing is a kind angular contact thrust ball bearing (contact angle 60°) with high precision, high speed, high axial stiffness, low friction, long life and transient high/low speed conversion. The ball screw bearing is particularly suitable for the supporting of ball screw and similar transmitting components in high-speed precision CNC machine tools.

精密滚珠丝杠支撑轴承包括7602、7603、BS、BSS系列滚珠丝杠轴承四种产品。7602和7603系列是标准公制，内径从12mm到130mm;BS系列滚珠丝杠轴承是非标公制和BSS系列为英制。

Precision ball screw support bearings include four kinds of products: 7602, 7603, BS, BSS series ball screw bearings. The 7602 and 7603 series are standard metric, with the inner diameters from 12mm to 130mm; BS series bearings for ball screws are non-standard metric and BSS series are inch series.

产品特点 Features

1.传动效率高 High transmission efficiency
2.运行稳定 Stable movement
3. 高精度 High precision
4. 高耐用性 High durability
5. 高可靠性 High reliability

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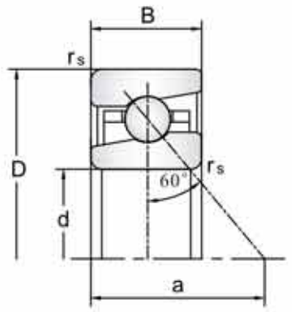
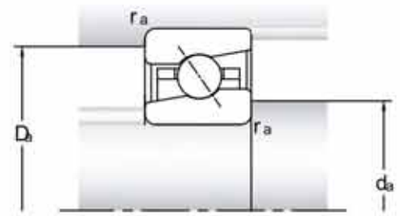
丝杠用推力角接触球轴承
Ball Screw Support Bearings
760Series α=60°





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	外形尺寸 Demension					安装尺寸 Abutment demensions			额定载荷 Load rating	
	d	D	B	r_{smin}	a	da	Da	r_a	Ca	Coa
	mm					min	max	max	kN	
7602020TVP	20	47	14	1.0	36	27.5	39.5	1.0	19.3	25
7602025TVP	25	52	15	1.0	41	32.0	45.0	1.0	22	30.5
7602030TVP	30	62	16	1.0	48	39.5	52.5	1.0	26	39
7602035TVP	35	72	17	1.1	55	46.5	60.5	1.4	30	50
7602040TVP	40	80	18	1.1	62	53.5	68.5	1.1	37.5	64
7602045TVP	45	85	19	1.1	66	57.0	73.0	1.1	38	68
7602050TVP	50	90	20	1.1	71	63.0	79.0	1.1	39	75
7602055TVP	55	100	21	1.5	78	69.5	85.5	1.5	40.5	81.5
7602060TVP	60	110	22	1.5	86	77.0	96.0	1.5	56	112
7602065TVP	65	120	23	1.5	92	84.0	103.0	1.5	57	122
7602070TVP	70	125	24	1.5	96	87.0	108.0	1.5	65.5	137
7602075TVP	75	130	25	1.5	101	93.5	114.5	1.5	67	150
7602080TVP	80	140	26	2.0	108	100.0	122.0	2.0	76.5	175
7602085TVP	85	150	28	2.0	116	107.0	131.0	2.0	86.5	196
7602090TVP	90	160	30	2.0	123	113.5	138.5	2.0	98	224
7603020TVP	20	52	15	1.1	39	30.5	43.5	1.1	24.5	32
7603025TVP	25	62	17	1.1	46	38.0	52.0	1.1	28.5	41.5
7603030TVP	30	72	19	1.1	53	45.0	61.0	1.1	34.5	55
7603035TVP	35	80	21	1.5	60	51.0	67.0	1.5	36.5	61
7603040TVP	40	90	23	1.5	68	56.5	75.7	1.5	50	83
7603045TVP	45	100	25	1.5	75	64.5	85.5	1.5	58.5	104
7603050TVP	50	110	27	2.0	83	72.0	94.0	2.0	69.5	127
7603055TVP	55	120	29	2.0	90	77.0	101.0	2.0	78	146
7603060TVP	60	130	31	2.1	98	82.5	107.5	2.1	88	166
7603065TVP	65	140	33	2.1	105	91.5	118.5	2.1	100	196
7603070TVP	70	150	35	2.1	113	95.5	124.5	2.1	110	220
7603075TVP	75	160	37	2.1	120	105.5	135.5	2.1	125	255
7603080TVP	80	170	39	2.1	128	111.0	143.0	2.1	137	285
7603085TVP	85	180	41	3.0	135	116.0	151.0	3.0	160	325
7603090TVP	90	190	43	3.0	143	122.5	157.5	3.0	163	345

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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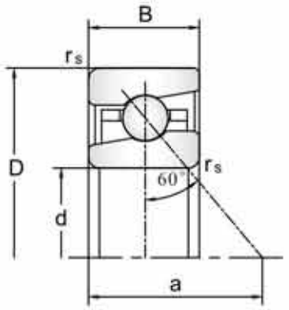
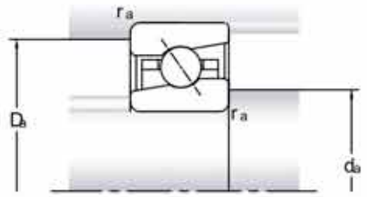
极限转速 Attainable Speed		预载荷 Preloading	轴向刚度 Axial rigidity	卸载载荷 Unloading force	摩擦力矩 Friction torque	参考填脂量 Reference grease filling	重量 Weight	轴承 Designation
脂 Oil	油 Grease	Fao	Ra	Fam				
r/min		kN	N/μm	kN	Nmm	g	kg	
12000	17000	2.3	700	6.6	50	1.6	0.13	7602020TVP
11000	16000	2.5	770	7.2	65	2.2	0.16	7602025TVP
9000	13000	2.9	890	8.3	86	3.0	0.24	7602030TVP
8000	11000	3.3	1020	9.5	115	4.0	0.34	7602035TVP
7000	9500	4.3	1180	12	170	5.0	0.44	7602040TVP
6700	9000	4.5	1240	12	190	6.0	0.50	7602045TVP
6300	8500	4.9	1360	14	230	7.2	0.67	7602050TVP
6000	8000	5.6	1390	13	250	8.7	0.75	7602055TVP
5000	6700	6.5	1620	18	350	11	0.96	7602060TVP
4800	6000	7.0	1750	20	410	13	1.20	7602065TVP
4500	6000	7.0	1750	20	440	15	1.32	7602070TVP
4300	5600	7.6	1880	21	480	17	1.45	7602075TVP
4000	5300	8.9	2040	25	600	20	1.76	7602080TVP
3800	5000	10.5	2200	30	760	25	2.19	7602085TVP
3600	4800	11.0	2270	31	790	30	2.69	7602090TVP
11000	16000	2.9	780	8.3	60	1.9	0.17	7603020TVP
9000	13000	3.3	910	9.5	85	3.5	0.28	7603025TVP
8000	11000	4.3	1070	12	130	5.0	0.41	7603030TVP
7000	9500	4.8	1190	13	170	6.6	0.55	7603035TVP
6300	8500	5.6	1290	16	225	9.2	0.76	7603040TVP
5600	7500	7.0	1780	20	300	12	1.02	7603045TVP
5000	6700	7.6	1600	21	360	16	1.33	7603050TVP
4800	6300	8.8	1720	25	460	20	1.69	7603055TVP
4500	6000	10.0	1840	28	540	24	2.12	7603060TVP
4000	5300	12.0	2050	34	700	29	2.60	7603065TVP
3800	5000	12.0	2100	34	760	34	3.16	7603070TVP
3600	4800	14.5	2330	41	920	41	3.79	7603075TVP
3400	4500	16.0	2460	46	1100	49	4.50	7603080TVP
3200	4300	17.5	2530	50	1250	55	5.29	7603085TVP
3000	4000	18.0	2650	51	1300	65	6.17	7603090TVP

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note：If the bearings not listed , please contact with us.





尺寸表 · 单位：mm Dimenisons Unit:mm

BS非标公制系列 BS non-standard series													
轴承 Designation	外形尺寸 Dimensions					参考安装尺寸 Abutment dimensions			额定载荷 Loading force		极限转速 Attainable speed		重量 Weight
	d	D	B	rsmin	a	da	Da	ra	Ca	Coa	脂 Oil	油 Grease	≈
	mm				≈				KN		r/min		kg
BS1547TN1	15	47	15	1.0	35	27.5	39.5	1.0	21.5	27	12000	17000	0.14
BS1747TN1	17	47	15	1.0	35	27.5	39.5	1.0	21.5	27	12000	17000	0.14
BS2047TN1	20	47	15	1.0	37	27.5	39.5	1	19.3	25	12000	17000	0.13
BS2562TN1	25	62	15	1.0	46	38.0	52.0	1.0	28.5	41.5	9000	13000	0.24
BS3062TN1	30	62	15	1.0	48	39.5	52.5	1	26	39	9000	13000	0.23
BS3072TN1	30	72	15	1.0	52	45.0	61.0	1.1	31.0	54	8000	11000	0.35
BS3572TN1	35	72	15	1.0	54	46.5	60.5	1.1	30	50	8000	11000	0.3
BS4072TN1	40	72	15	1.0	56	49.0	62.5	1.1	28.0	49	8000	11000	0.26
BS4090TN1	40	90	20	1.5	67	56.5	75.5	1.5	50	83	6300	8500	0.65
BS4575TN1	45	75	15	1.0	60	52.0	68.0	1.0	28.5	52	7500	10000	0.26
BS45100TN1	45	100	20	1.5	74	64.5	85.5	1.5	58.5	104	5600	75000	0.81
BS50100TN1	50	100	20	1.5	76	64.5	85.5	1.5	58.5	104	5600	75000	0.75
BS5590TN1	55	90	15	1.0	70	65	80	1	32.5	65.5	6300	85000	0.38
BS55100TN1	55	100	20	1.5	77	69.5	85.5	1.5	40.5	81.5	6000	8000	0.75
BS55120TN1	55	120	20	1.5	86	77	97.5	2	60	116	5000	6700	1.18
BS60120TN1	60	120	20	1.5	88	79.5	100.5	1.5	61.0	120	4800	6300	1.11
BS75110TN1	75	110	15	1.5	88	85	99.5	1.5	35.5	83	5000	6700	0.7
BS100150TN1	100	150	22.5	2.0	120	114.5	135.0	2.0	69.5	173	3800	5000	1.37

注：若需要本尺寸表中未列入的轴承，请与我们联系。
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丝杠轴承互换表
Ball Screw Support Bearings Exchange table

TIMKEN	BARDEN	FAG	NSK	NTN	RHP	SKF	SNFA
MM12BS32	–	7602012-TVP	–	–	–	BSA201	BS212
MM15BS35	–	7602015-TVP	–	–	–	BSA202	BS215
MM17BS47	–	–	17TAC47C10	BST17X47-1B	BSB017047	–	–
MM20BS47	BSB2047	BSB020047-T	20TAC47C10	BST20X47-1B	BSB020047	BSD2047	BS20/47
MM9306W12H	L078H	–	20TAC47XC11	BST20X47-2B	BSB078	–	–
MM9308W12H	L093H	–	23TAC62C11	BST23.8X62-1B	BSB093	–	–
MM25BS52	–	7602025-TVP	–	–	BSB2025	BSA205	BS225
MM25BS62	BSB2562	BSB025062-T	25TAC62C10	BST25X62-1B	BSB025062	BSD2562	BS25/62
MM30BS62	BSB3062	BSB030062-T	30TAC62C10	BST30X62-1B	BSB030062	BSD3062	BS30/62
MM30BS72	–	–	–	–	BSB030072	–	–
MM35BS72	BSB3572	BSB030572-T	35TAC72C10	BST35X72-1B	BSB035072	BSD3572	BS35/72
MM35BS100	–	–	–	–	BSB035100	–	–
MM9310W12H	L150H	–	38TAC72C11	BST38.1X72-1B	BSB150	–	–
MM40BS72	BSB4072	BSB040072-T	40TAC72C10	BST40X72-1B	BSB040072	BSD4072	BS40/72
MM40BS90	–	–	–	–	BSB040090	–	–
MM40BS90-20	–	BSB040090-T	40TAC90C10	BST40X90-1B	–	BSD4090	BS40/90
MM40BS90-23	–	7603040-TVP	–	–	–	BSA308	BS340
MM40BS100	–	–	–	–	BSB040100	–	–
MM9311W13H	L175H	–	44TAC76C11	BST44.5X76.2-1B	BSB175	–	–
MM45BS75	–	BSB045075-T	45TAC75C10	BST45X75-1B	BSB045075	BSD4575	–
MM45BS100	–	BSB045100-T	45TAC100C10	BST45X100-1B	BSB045100	BSD45100	BS45/100
MM50BS90	–	–	–	–	BSB050090	–	–
MM50BS100	–	BSB050100-T	50TAC100C10	BST50X100-1B	BSB050100	BSD50100	BS50/100
MM55BS90	–	BSB055090-T	55TAC90C10	–	BSB055090	–	–
MM55BS120	–	BSB055120-T	55TAC120C10	BST55X120-1B	BSB055120	BSD55120	BS55/120
MM9313W15H	L225H	–	57TAC90C11	–	BSB225	–	–
MM60BS120	–	BSB060120-T	60TAC120C10	BST60X120-1B	BSB060120	BSD60120	BS60/120
MM75BS110	–	BSB075110-T	–	–	BSB075110	–	–
MM9316W13H	L300H	–	76TAC110C11	–	BSB300	–	–
MM100BS150	–	–	–	–	BSB100150	–	–
MM9321W13	–	–	101TAC145C11	–	BSB400	–	–

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推力角接触球轴承
Thrust Angular Contact Ball Bearing

产品概览　推力角接触球轴承
Product overview Axial angular contact ball bearings

双列设计，
带安装孔
唇式密封或最小间隙密封
Double row design,
for screw mounting
Lip seals or minimal gap seals

ZKLF..-2RS、 ZKLF..-2Z、
ZKLF..-2RS-PE

配对设计
Matched pair design

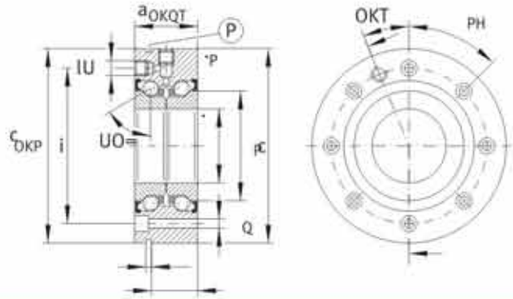
ZKLF..-2RS-2AP

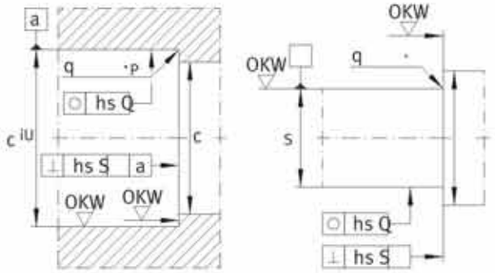
双列设计，
不带安装孔
唇式密封或最小间隙密封
Double row design,
not for screw mounting
Lip seals or minimal gap seals

ZKLN..-2RS、 ZKLN..-2Z、
ZKLN..-2RS-PE

配对设计
Matched pair design

ZKLN..-2RS-2AP





推力角接触球轴承
Thrust Angular Contact Ball Bearing

尺寸表 · 单位：mm
Dimenisons Unit:mm

轴承 Designation	尺寸 Dimensions										角度 Pitch n×t	安装尺寸 Mounting dimensions			固定螺栓Fixing screwsDIN EN ISO 4762 10.9		基本额定载荷 Basic load ratings axial		疲劳极限载荷 Fatiguelimit load
	d	D	B	d_1	r min	r_1 min	J	d_2	b	l		Da max	da min	t_1	Size	$n_B \times t_B$	dyn.Ca N	stat. C_{0a} N	C_u N
ZKLF1255-2RS	12	55	25	25	0.3	0.6	42	6.8	3	17	3x120°	33	16	0.1	M6	3×120°	18,600	24,700	1,460
ZKLF1255-2Z	12	55	25	25	0.3	0.6	42	6.8	3	17	3x120°	33	16	0.1	M6	3×120°	18,600	24,700	1,460
ZKLF1560-2RS	15	60	25	28	0.3	0.6	46	6.8	3	17	3x120°	35	20	0.1	M6	3×120°	19,600	28,000	1,650
ZKLF1560-2Z	15	60	25	28	0.3	0.6	46	6.8	3	17	3x120°	35	20	0.1	M6	3×120°	19,600	28,000	1,650
ZKLF1762-2RS	17	62	25	30	0.3	0.6	48	6.8	3	17	6x60°	37	23	0.1	M6	3×120°	20,700	31,000	1,840
ZKLF1762-2Z	17	62	25	30	0.3	0.6	48	6.8	3	17	6x60°	37	23	0.1	M6	3×120°	20,700	31,000	1,840
ZKLF2068-2RS	20	68	28	34.5	0.3	0.6	53	6.8	3	19	8x45°	43	25	0.1	M6	4×90°	28,500	47,000	2,750
ZKLF2068-2Z	20	68	28	34.5	0.3	0.6	53	6.8	3	19	8x45°	43	25	0.1	M6	4×90°	28,500	47,000	2,750
ZKLF2575-2RS	25	75	28	40.5	0.3	0.6	58	6.8	3	19	8x45°	48	32	0.1	M6	4×90°	30,500	55,000	3,250
ZKLF2575-2Z	25	75	28	40.5	0.3	0.6	58	6.8	3	19	8x45°	48	32	0.1	M6	4×90°	30,500	55,000	3,250
ZKLF3080-2RS	30	80	28	45.5	0.3	0.6	63	6.8	3	19	12x30°	53	40	0.1	M6	6×60°	32,000	64,000	3,750
ZKLF3080-2Z	30	80	28	45.5	0.3	0.6	63	6.8	3	19	12x30°	53	40	0.1	M6	6×60°	32,000	64,000	3,750
ZKLF30100-2RS	30	100	38	51	0.3	0.6	80	8.8	3	30	8x45°	64	47	0.2	M8	8×45°	65,000	108,000	6,400
ZKLF30100-2Z	30	100	38	51	0.3	0.6	80	8.8	3	30	8x45°	64	47	0.2	M8	8×45°	65,000	108,000	6,400
ZKLF3590-2RS	35	90	34	52	0.3	0.6	75	8.8	3	25	8x45°	62	45	0.2	M8	4×90°	45,000	89,000	5,200
ZKLF3590-2Z	35	90	34	52	0.3	0.6	75	8.8	3	25	8x45°	62	45	0.2	M8	4×90°	45,000	89,000	5,200
ZKLF40100-2RS	40	100	34	58	0.3	0.6	80	8.8	3	25	8x45°	67	50	0.2	M8	4×90°	47,500	101,000	6,000
ZKLF40100-2Z	40	100	34	58	0.3	0.6	80	8.8	3	25	8x45°	67	50	0.2	M8	4×90°	47,500	101,000	6,000
ZKLF40115-2RS	40	115	46	65	0.6	0.6	94	8.8	3	36	12x30°	80	56	0.2	M8	12×30°	79,000	149,000	8,800
ZKLF40115-2Z	40	115	46	65	0.6	0.6	94	8.8	3	36	12x30°	80	56	0.2	M8	12×30°	79,000	149,000	8,800
ZKLF50115-2RS	50	115	34	72	0.3	0.6	94	8.8	3	25	12x30°	82	63	0.2	M8	6×60°	51,000	126,000	7,400
ZKLF50115-2Z	50	115	34	72	0.3	0.6	94	8.8	3	25	12x30°	82	63	0.2	M8	6×60°	51,000	126,000	7,400
ZKLF50140-2RS	50	140	54	80	0.6	0.6	113	11.0	3	45	12x30°	98	63	0.2	M10	12×30°	125,000	250,000	14,800
ZKLF50140-2Z	50	140	54	80	0.6	0.6	113	11.0	3	45	12x30°	98	63	0.2	M10	12×30°	125,000	250,000	14,800
ZKLF60145-2Z	60	145	45	85	0.6	0.6	120	8.8	3	35	8x45°	100	82	0.2	M8	8×45°	93,000	214,000	12,600
ZKLF70155-2Z	70	155	45	95	0.6	0.6	130	8.8	3	35	8x45°	110	92	0.2	M8	8×45°	97,000	241,000	14,200
ZKLF80165-2Z	80	165	45	105	0.6	0.6	140	8.8	3	35	8x45°	120	102	0.2	M8	8×45°	100,000	265,000	15,400
ZKLF90190-2Z	90	190	55	120	0.6	0.6	165	11.0	3	45	8x45°	138	116	0.2	M10	8×45°	149,000	395,000	21,300
ZKLF100200-2Z	100	200	55	132	0.6	0.6	175	11.0	3	45	8x45°	150	128	0.2	M10	8×45°	154,000	435,000	22,400
ZKLF100230-2Z	100	230	85	146	0.6	0.6	200	14.0	3	73	12x30°	175	130	0.4	M12	12×30°	295,000	790,000	29,000
ZKLF1255-2RS-PE	12	55	25	25	0.3	0.6	42	6.8	3	17	3x120°	33	16	0.1	M6	3×120°	16,900	24,700	1,090
ZKLF1560-2RS-PE	15	60	25	28	0.3	0.6	46	6.8	3	17	3x120°	35	20	0.1	M6	3×120°	17,900	28,000	1,240
ZKLF1762-2RS-PE	17	62	25	30	0.3	0.6	48	6.8	3	17	6x60°	37	23	0.1	M6	3×120°	18,800	31,000	1,380
ZKLF2068-2RS-PE	20	68	28	34.5	0.3	0.6	53	6.8	3	19	8×45°	43	25	0.1	M6	4×90°	26,000	47,000	2,070
ZKLF2575-2RS-PE	25	75	28	40.5	0.3	0.6	58	6.8	3	19	8×45°	48	32	0.1	M6	4×90°	27,500	55,000	2,450
ZKLF3080-2RS-PE	30	80	28	45.5	0.3	0.6	63	6.8	3	19	12x30°	53	40	0.1	M6	6×60°	29,000	64,000	2,800
ZKLF3590-2RS-PE	35	90	34	52	0.3	0.6	75	8.8	3	25	8x45°	62	45	0.2	M8	4×90°	41,000	89,000	3,950

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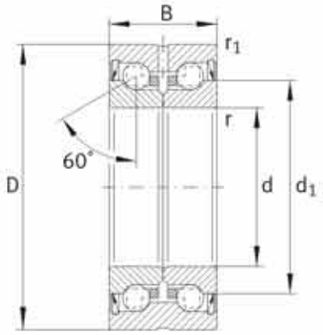
极限转速 Limiting speed	热安全运转速度 Thermally safe operating speed	轴承摩擦力矩 Bearing frictional torque MR Nm	刚度 Rigidity axialcaL N/μm	倾斜刚度 Tilting rigidity C_{kL}	质量惯性矩 Mass moment of inertia M_{in}	轴向跳动 Axial runout μm	精密锁紧螺母的建议值 Recommended precision locknut			轴向必要的锁紧力 Required locknut force axial N	重量 Mass
n_G grease min^{-1}	n_P min^{-1}						用于径向防松锁紧 For radiallocking	用于轴向防松锁紧 For axial locking	锁紧力矩 Tightningtorque MxNm		m ≈ kg
9,200	3,800	0.16	375	50	0.068	2	Zm12	–	8	5,307	0.37
12,000	7,600	0.08	375	50	0.068	2	ZM12	–	8	5,307	0.37
8,200	3,500	0.20	400	65	0.102	2	ZM15	AM15	10	5,484	0.43
10,800	7,000	0.10	400	65	0.102	2	ZM15	AM15	10	5,484	0.43
7,600	3,300	0.24	450	80	0.132	2	ZM17	AM17	15	7,514	0.45
10,100	6,600	0.12	450	80	0.132	2	ZM17	AM17	15	7,514	0.45
6,600	3,000	0.30	650	140	0.273	2	ZM20	AM20	18	8,258	0.61
8,700	5,400	0.15	650	140	0.273	2	ZM20	AM20	18	8,258	0.61
5,700	2,600	0.40	750	200	0.486	2	ZM25	AM25	25	9,123	0.72
7,500	4,700	0.20	750	200	0.486	2	ZM25	AM25	25	9,123	0.72
5,000	2,200	0.50	850	300	0.730	3	ZM30	AM30	32	9,947	0.78
6,700	4,300	0.25	850	300	0.730	3	ZM30	AM30	32	9,947	0.78
4,500	2,100	0.80	950	400	1.910	3	ZMA30/52	AM30	65	19,509	1.63
5,600	4,000	0.40	950	400	1.910	3	ZMA30/52	AM30	65	19,509	1.63
4,400	2,000	0.60	900	400	1.510	3	ZM35	AM35/58	40	10,770	1.13
5,800	3,800	0.30	900	400	1.510	3	ZM35	AM35/58	40	10,770	1.13
4,000	1,800	0.70	1000	550	2.260	3	ZM40	AM40	55	13,412	1.46
5,200	3,300	0.35	1000	550	2.260	3	ZM40	AM40	55	13,412	1.46
3,500	1,600	1.30	1200	750	5.500	3	ZMA40/62	AM40	110	25,185	2.2
4,400	3,100	0.65	1200	750	5.500	3	ZMA40/62	AM40	110	25,815	2.2
3,200	1,500	0.90	1250	1000	5.240	3	ZM50	AM50	85	16,280	1.86
4,200	3,000	0.45	1250	1000	5.240	3	ZM50	AM50	85	16,280	1.86
2,900	1,200	2.60	1400	1500	15.200	3	ZMA50/75	AM50	150	28,451	4.7
3,500	2,500	1.30	1400	1500	15.200	3	ZMA50/75	AM50	150	28,451	4.7
4,000	3,000	1.00	1300	1650	13.700	3	ZMA60/98	AM60	100	16,700	4.3
3,800	2,800	1.20	1450	2250	19.800	3	ZMA70/110	AM70	130	19,031	4.9
3,600	2,700	1.40	1600	3000	27.600	3	ZMA80/120	AM80	160	20,604	5.3
3,500	2,300	2.30	1700	4400	59.900	3	ZMA90/130	AM90	200	22,731	8.7
3,300	2,150	2.60	1900	5800	85.300	3	ZMA100/140	AM100	250	25,624	9.3
2,900	2,000	3.00	2450	8200	185.000	3	–	AM100	500	52,000	17.6
9,200	3,800	0.16	375	50	0.068	5	ZM12	-	8	5,307	0.37
8,200	3,500	0.20	400	65	0.102	5	ZM15	AM15	10	5,484	0.43
7,600	3,300	0.24	450	80	0.132	5	ZM17	AM17	15	7,514	0.45
6,600	3,000	0.30	650	140	0.273	5	ZM20	AM20	18	8,258	0.61
5,700	2,600	0.40	750	200	0.486	5	ZM25	AM25	25	9,123	0.72
5,000	2,200	0.50	850	300	0.730	5	ZM30	AM30	32	9,947	0.78
4,400	2,000	0.60	900	400	1.510	5	ZM35	AM35/58	40	10,770	1.13



推力角接触球轴承
Thrust Angular Contact Ball Bearing

尺寸表 · 单位：mm
Dimenisons Unit:mm

轴承 Designation	尺寸 Dimensions						安装尺寸 Mounting dimensions		轴向基本额定载荷 Basic load ratings axial		疲劳极限载荷 Fatigue limit load C_uN	极限转速 Lim- itingspeed n_G grease 脂min	热安全运转速度 Thermally safe operating speed $n_\theta$min
	d	D	B	d_1	r min.	r_1 min.	D_a max.	d_a min.	dyn. C_a N	stat. $C0_a$N			
ZKLN0619-2Z	6	19	12	12	0.3	0.3	16	9	5400	6100	360	22800	14000
ZKLN0624-2RS	6	24	15	14	0.3	0.6	19	9	7600	8500	500	16400	6800
ZKLN0624-2Z	6	24	15	14	0.3	0.6	19	9	7600	8500	500	19900	12000
ZKLN0832-2RS	8	32	20	19	0.3	0.6	26	11	13800	16300	960	12100	5100
ZKLN0832-2Z	8	32	20	19	0.3	0.6	26	11	13800	16300	960	15500	9500
ZKLN1034-2RS	10	34	20	21	0.3	0.6	28	14	14700	18800	1110	10900	4600
ZKLN1034-2Z	10	34	20	21	0.3	0.6	28	14	14700	18800	1110	14400	8600
ZKLN1242-2RS	12	42	25	25	0.3	0.6	33	16	18600	24700	1460	9200	3800
ZKLN1242-2Z	12	42	25	25	0.3	0.6	33	16	18600	24700	1460	12000	7600
ZKLN1545-2RS	15	45	25	28	0.3	0.6	35	20	19600	28000	1650	8200	3500
ZKLN1545-2Z	15	45	25	28	0.3	0.6	35	20	19600	28000	1650	10800	7000
ZKLN1747-2RS	17	47	25	30	0.3	0.6	37	23	20700	31000	1840	7600	3300
ZKLN1747-2Z	17	47	25	30	0.3	0.6	37	23	20700	31000	1840	10100	6600
ZKLN2052-2RS	20	52	28	34.5	0.3	0.6	43	25	28500	47000	2750	6600	3000
ZKLN2052-2Z	20	52	28	34.5	0.3	0.6	43	25	28500	47000	2750	8700	5400
ZKLN2557-2RS	25	57	28	40.5	0.3	0.6	48	32	30500	55000	3250	5700	2600
ZKLN2557-2Z	25	57	28	40.5	0.3	0.6	48	32	30500	55000	3250	7500	4700
ZKLN3062-2RS	30	62	28	45.5	0.3	0.6	53	40	32000	64000	3750	5000	2200
ZKLN3062-2Z	30	62	28	45.5	0.3	0.6	53	40	32000	64000	3750	6700	4300
ZKLN3072-2RS	30	72	38	51	0.3	0.6	64	47	65000	108000	6400	4500	2100
ZKLN3072-2Z	30	72	38	51	0.3	0.6	64	47	65000	108000	6400	5600	4000
ZKLN3572-2RS	35	72	34	52	0.3	0.6	62	45	45000	89000	5200	4400	2000
ZKLN3572-2Z	35	72	34	52	0.3	0.6	62	45	45000	89000	5200	5800	3800
ZKLN4075-2RS	40	75	34	58	0.3	0.6	67	50	47500	101000	6000	4000	1800
ZKLN4075-2Z	40	75	34	58	0.3	0.6	67	50	47500	101000	6000	5200	3300
ZKLN4090-2RS	40	90	46	65	0.6	0.6	80	56	79000	149000	8800	3500	1600
ZKLN4090-2Z	40	90	46	65	0.6	0.6	80	56	79000	149000	8800	4400	3100
ZKLN5090-2RS	50	90	34	72	0.3	0.6	82	63	51000	126000	7400	3200	1500
ZKLN5090-2Z	50	90	34	72	0.3	0.6	82	63	51000	126000	7400	4200	3000
ZKLN50110-2RS	50	110	54	80	0.6	0.6	98	63	125000	250000	14800	2900	1200
ZKLN50110-2Z	50	110	54	80	0.6	0.6	98	63	125000	250000	14800	3500	2500
ZKLN60110-2Z	60	110	45	85	0.6	0.6	100	82	93000	214000	12600	4000	3000
ZKLN70120-2Z	70	120	45	95	0.6	0.6	110	92	97000	241000	14200	3800	2800
ZKLN80130-2Z	80	130	45	105	0.6	0.6	120	102	100000	265000	15400	3600	2700
ZKLN90150-2Z	90	150	55	120	0.6	0.6	138	116	149000	395000	21300	3500	2300
ZKLN100160-2Z	100	160	55	132	0.6	0.6	150	128	154000	435000	22400	3300	2150
ZKLN0624-2RS-PE	6	24	15	14	0.3	0.6	19	9	6900	8500	375	16400	6800

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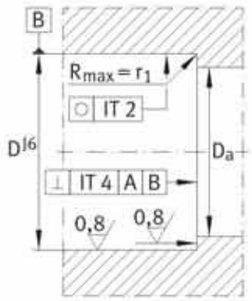
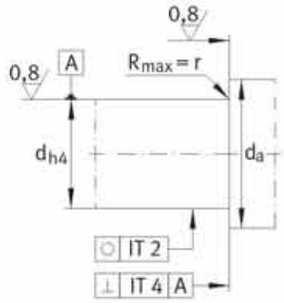
MONTON





轴承摩擦力矩 Bearing frictional torque M_R Nm	轴向刚度 Rigidity axial c_{aL} N/μm	倾斜刚度 Tilting rigidity c_{kL} Nm/mrad	质量惯性矩 Mass moment of inertia $M_m$kg · cm²	轴向跳动 Axial runout μm	精密锁紧螺母的建议值 Recommended precision locknut			轴向必要锁紧力矩 Required locknut force axial N	重量 Mass m = kg
					用于径向防松锁紧 For radial locking	用于轴向防松锁紧 For axial locking	锁紧力矩 Tightening torque M_ANm		
0.01	150	4	0.0019	2	Zm06	–	1	2010	0.02
0.04	200	8	0.0044	2	ZM06	–	2	2404	0.03
0.02	200	8	0.0044	2	ZM06	–	2	2404	0.03
0.08	250	20	0.02	2	ZM08	–	4	3468	0.09
0.04	250	20	0.02	2	ZM08	–	4	3468	0.09
0.12	325	25	0.029	2	ZM10	–	6	4891	0.1
0.06	325	25	0.029	2	ZM10	–	6	4891	0.1
0.16	375	50	0.068	2	ZM12	–	8	5307	0.2
0.08	375	50	0.068	2	ZM12	–	8	5307	0.2
0.2	400	65	0.102	2	ZM15	AM15	10	5484	0.21
0.1	400	65	0.102	2	ZM15	AM15	10	5484	0.21
0.24	450	80	0.132	2	ZM17	AM17	15	7514	0.22
0.12	450	80	0.132	2	ZM17	AM17	15	7514	0.22
0.3	650	140	0.273	2	ZM20	AM20	18	8258	0.31
0.15	650	140	0.273	2	ZM20	AM20	18	8258	0.31
0.4	750	200	0.486	2	ZM25	AM25	25	9123	0.34
0.2	750	200	0.486	2	ZM25	AM25	25	9123	0.34
0.5	850	300	0.73	2.5	ZM30	AM30	32	9947	0.39
0.25	850	300	0.73	2.5	ZM30	AM30	32	9947	0.39
0.8	950	400	1.91	2.5	ZMA30/52	AM30	65	19509	0.72
0.4	950	400	1.91	2.5	ZMA30/52	AM30	65	19509	0.72
0.6	900	400	1.51	2.5	ZM35	AM35/58	40	10770	0.51
0.3	900	400	1.51	2.5	ZM35	AM35/58	40	10770	0.51
0.7	1000	550	2.26	2.5	ZM40	AM40	55	13412	0.61
0.35	1000	550	2.26	2.5	ZM40	AM40	55	13412	0.61
1.3	1200	750	5.5	2.5	ZMA40/62	AM40	110	25185	0.95
0.65	1200	750	5.5	2.5	ZMA40/62	AM40	110	25185	0.95
0.9	1250	1000	5.24	2.5	ZM50	AM50	85	16280	0.88
0.45	1250	1000	5.24	2.5	ZM50	AM50	85	16280	0.88
2.6	1400	1500	15.2	2.5	ZMA50/75	AM50	150	28451	2.5
1.3	1400	1500	15.2	2.5	ZMA50/75	AM50	150	28451	2.5
1	1300	1650	13.7	3	ZMA60/98	AM60	100	16700	2.2
1.2	1450	2250	19.8	3	ZMA70/110	AM70	130	19031	2.4
1.4	1600	3000	27.6	3	ZMA80/120	AM80	160	20604	2.7
2.3	1700	4400	59.9	3	ZMA90/130	AM90	200	22731	4.5
2.6	1900	5800	85.3	3	ZMA100/140	AM100	250	25624	4.9
0.04	200	8	0.0044	5	ZM06	–	2	2404	0.03

超精密圆柱滚子轴承

High Precision Cylindrical Roller Bearings

MONTON

●Precision Cylindrical Roller Bearings

代号例 Bearings Designation system：

NN | 30 | 20 | K | M | W33 | P4 | C1

轴承类型代号
Bearing Type

NN：双列圆柱滚子轴承
外围无挡边，内圈有双挡边
N：单列圆柱滚子轴承
外围无挡边，内圈有双挡边
NN : Cylindrical Roller Bearings
Double row lips on inner ring
NNU Cylindrical Roller Bearings
Double row lips on outer ring
N: Cylindrical Roller Bearings
Single row lips on inner ring

尺寸系列代号
Dimension series

10，30，49分别代表轴承的
直径宽度系列
49: light series
30: Medium series
10: Medium series

内径代号
Bore series

轴承内径=内径代号 x 5mm

ID=bore size × 5
06 6 × 5=30mm
08 8 × 5=40mm

圆锥内孔代号
Tapered Bore

K：锥度为1:12的圆锥内孔
无标记为圆柱内孔
K: Tapered bore 1:12
−：Cylindrical bore

游隙代号 Clearance

C1,C2,C3：分别代表轴承
国际GB/T4604−1993的
1,2,3组游隙
C2 C0 C3: ISO Standard

公差等级代号 Accuracy

P2,P4,P5：分别代表轴承采用国际
GB/T307.1−2005的2,4,5级公差
和JB/T5356−2005规格的SP、UP
级公差
SP: Special precision
Up: ultra precision
P2 P4 P5 : ISO precision

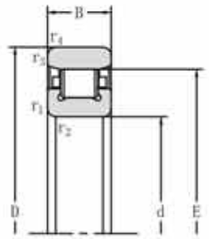
油孔代号 Oil groove

W33：轴承外圈外径有油槽孔
W33 :Oil hole on outer ring

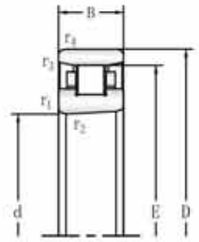
保持架材料代号 Cage

M：代表铜保持架
TN：尼龙保持架
M: brass cage
TN: Nylon Cage

超精密圆柱滚子轴承
Precision Cylindrical Roller Bearings



N10...

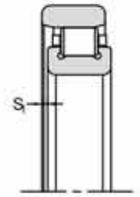


N10...K

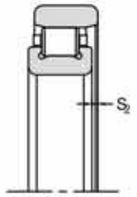
尺寸表 · 单位：mm
Dimenisons Unit:mm

轴承 Designation	尺寸 Demensions					安装尺寸 Mounting Dimensions		
	d	D	B	$R_s$min	E	d_a	D_a	R_a
	mm					min	max	max
N1006	30	55	13	1.0	48.5	33.5	49	0.6
N1007	35	62	14	1.0	55	38.8	56	0.6
N1008	40	68	15	1.0	61	43.5	62	0.6
N1009	45	80	16	1.0	67.5	48.5	69	0.6
N1010	50	80	16	1.0	72.5	53.5	74	0.6
N1011	55	90	18	1.1	80.5	61	82	1.0
N1012	60	95	18	1.1	85.5	66	87	1.0
N1013	65	100	18	1.1	90.5	71	92	1.0
N1014	70	110	20	1.1	100	76	120	1.0
N1015	75	115	20	1.1	105	81	107	1.0
N1016	80	125	22	1.1	113.5	86	115	1.0
N1017	85	130	22	1.1	118.5	91	120	1.0
N1018	90	140	24	1.5	127	97	129	1.0
N1019	95	145	24	1.5	132	102	134	1.0
N1020	100	150	24	1.5	137	107	139	1.0
N1021	105	160	26	2.0	145.5	114	148	1.0
N1022	110	170	28	2.0	155	118	157	1.0
N1024	120	180	28	2.0	165	129	167	1.0
N1026	130	200	33	2.0	182	139	184	1.0
N1028	140	210	33	2.0	192	149	194	1.0
N1030	150	225	33	2.1	205.5	160.5	208	1.5
N1032	160	240	33	2.1	220	170.5	222	1.5
N1034	170	260	33	2.1	237	180.5	239	2.1
N1036	180	280	33	2.1	255	190.5	258	2.1
N1038	190	290	33	2.1	265	200.5	268	2.1
N1040	200	310	33	2.1	281	210.5	285	2.1
N1044	220	340	33	3.0	310	232.5	313	2.5
N1048	240	360	33	3.0	330	252.5	334	2.5
N1052	260	400	33	4.0	364	275	368	3.0
N1056	280	420	33	4.0	384	295	388	3.0

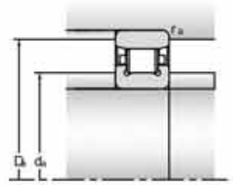
注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note:If the bearings nost list here, please contact with us.



直接润滑



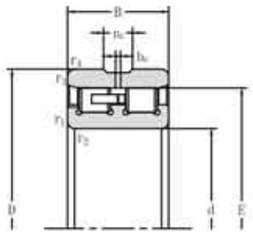
轴向位移



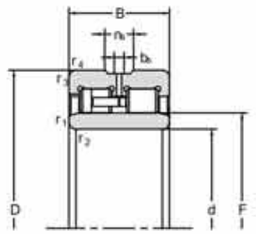
安装尺寸

基本额定载荷 Load		转速 RPM		径向刚度 Stiffness	质量 Weight	轴承 Designation
Cr	Cor	Oil	Lub	Rr	≈	
KN		r/min		N/μm	Kg	
18.6	18	19000	22000	0.3	0.13	N1006K
23.6	24.5	16000	18000	0.4	0.17	N1007K
27.5	29	15000	17000	0.4	0.22	N1008K
32.5	35.5	13000	15000	0.5	0.27	N1009K
36	41.5	12000	14000	0.5	0.29	N1010K
41.5	50	11000	13000	0.6	0.44	N1011K
44	55	10000	12000	0.7	0.47	N1012K
45	58.5	9500	11000	0.7	0.49	N1013K
64	81	9000	10000	0.8	0.69	N1014K
65.5	85	8500	9500	0.8	0.72	N1015K
76.5	98	7500	8500	0.9	0.98	N1016K
78	104	7500	8500	0.9	1.04	N1017K
93	125	6700	7500	1.0	1.34	N1018K
96.5	129	6300	7000	1.0	1.4	N1019K
98	134	6000	6700	1.1	1.46	N1020K
112	153	6500	6300	1.1	1.82	N1021K
140	190	4800	6000	1.2	2.3	N1022K
150	208	4800	5600	1.3	2.47	N1024K
180	250	4300	4800	1.4	3.72	N1026K
183	265	4000	4500	1.4	3.94	N1028K
208	310	3800	4300	1.6	4.75	N1030K
245	355	3400	3800	1.6	5.79	N1032K
300	430	3200	3600	1.8	7.77	N1034K
360	520	3000	3400	1.9	10.2	N1036K
365	550	2800	3200	2.0	10.6	N1038K
400	600	2600	3000	2.1	14	N1040K
510	765	2400	2800	2.3	17.9	N1044K
540	850	2200	2600	2.5	19.3	N1048K
655	1020	1900	2200	2.7	28.6	N1052K
680	1100	1800	2000	2.9	30.9	N1056K

超精密圆柱滚子轴承
Precision Cylindrical Roller Bearings



NN30

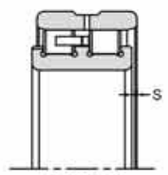


NNU49

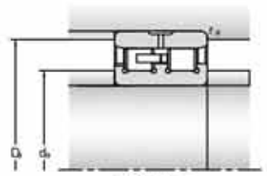
尺寸表 · 单位：mm
Dimenisons Unit:mm

轴承 Designation	质量 Weight m=kg	尺寸 Demension d	D	B	r_1 min	E	F	n_1	d_a
NN3006KW33	0.19	30	55	19	1.0	48.5	–	4.8	3.2
NN3007KW33	0.25	35	62	20	1.0	55	–	4.8	3.2
NN3008KW33	0.3	40	68	21	1.0	61	–	4.8	3.2
NN3009KW33	0.39	45	75	23	1.0	67.5	–	4.8	3.2
NN3010KW33	0.43	0.43	80	23	1.0	–	–	4.8	3.2
NN3011KW33	0.63	0.63	90	26	1.1	–	–	4.8	3.2
NN3012KW33	0.67	0.67	95	26	1.1	–	–	4.8	3.2
NN3013KW33	0.72	0.72	100	26	1.1	–	–	4.8	3.2
NNU4914KW33	0.73	0.73	100	30	1.0	80	80	4.8	3.2
NN3014KW33	1.04	1.04	110	30	1.1	–	–	6.5	3.2
NNU4915KW33	0.77	0.77	105	30	1.0	85	85	4.8	3.2
NN3015KW33	1.09	1.09	115	30	1.1	–	–	6.5	3.2
NNU4916KW33	0.81	0.81	110	30	1.0	90	90	4.8	3.2
NN3016KW33	1.51	1.51	125	34	1.1	–	–	6.5	3.2
NNU4917KW33	1.2	1.2	120	35	1.1	96.5	96.5	4.8	3.2
NN3017KW33	1.58	1.58	130	34	1.1	–	–	6.5	3.2
NNU4918KW33	1.26	1.26	125	35	1.1	101.5	101.5	4.8	3.2
NN3018KW33	2.05	2.05	140	37	1.5	–	–	6.5	3.2
NNU4919KW33	1.32	1.32	130	35	1.1	106.5	106.5	4.8	3.2
NN3019KW33	2.14	2.14	145	37	1.5	–	–	6.5	3.2
NNU4920KW33	1.86	1.86	140	40	1.1	113	113	6.5	3.2
NN3020KW33	2.23	2.23	150	37	1.5	–	–	6.5	3.2
NNU4921KW33	1.93	1.93	145	40	1.1	118	118	6.5	3.2
NN3021KW33	2.84	2.84	160	41	2.0	–	–	6.5	3.2
NNU4922KW33	2.01	110	150	40	1.1	–	123	6.5	3.2
NN3022KW33	3.61	110	170	45	2.0	155	–	6.5	3.2
NNU4924KW33	2.71	120	165	45	1.1	–	134.5	6.5	3.2
NN3024KW33	3.94	120	180	46	2.0	165	–	6.5	3.2

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note:If the bearings nost list here, please contact with us.



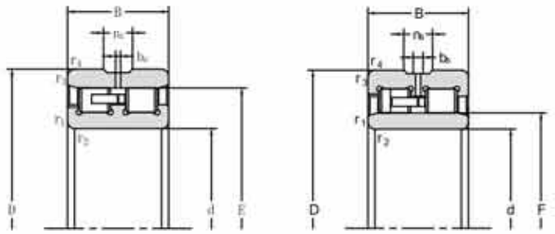
轴向位移
Axial displacement



安装尺寸
Abutment dimensions

轴向位移 Axial displacement s	安装尺寸 Abutment Dimensions $d_a h_{12}$	$D_a H_{12}$	r_{s1} max	基本额定载荷 Load Rating 动载荷 dyn Cr N	静载荷 sta C0 N	极限转速 Attainable Speed n_0脂 Grease min^{-1}	n_0油 Oil min^{-1}	径向刚度 Radial rigidity Rr KN/μm
1.4	38	50	1.0	29000	34000	16000	19000	680
1.4	43	57	1.0	36000	44000	14000	17000	790
1.4	48	63	1.0	45000	59000	12000	15000	950
1.7	54	69	1.0	54000	72000	11000	14000	1080
1.7	59	74	1.0	57000	80000	10000	10000	1180
1.9	65	83	1.1	72000	100000	9000	9000	1300
1.9	70	88	1.1	75000	110000	8500	8500	1410
1.9	75	93	1.1	77000	116000	8000	8000	1470
1.8	79	92	1.0	60000	104000	7500	7500	1700
2.3	82	102	1.1	98000	150000	7000	7000	1660
1.8	84	97	1.0	63000	114000	7000	7000	1870
2.3	87	107	1.1	100000	156000	6700	6700	1730
1.8	89	102	1.0	66000	122000	6700	6700	1980
2.5	93	116	1.1	120000	186000	6300	6300	1850
2.0	96	111	1.1	90000	166000	6300	6300	2280
2.5	98	121	1.1	125000	200000	6000	6000	1990
2.0	101	116	1.1	93000	176000	6000	6000	2420
2.6	105	130	1.5	140000	224000	5600	5600	2020
2.0	106	121	1.1	95000	186000	5600	5600	2560
2.6	110	135	1.5	143000	236000	5300	5300	2100
2.0	112	129	1.1	129000	255000	5300	5300	3000
2.6	115	140	1.5	146000	245000	5300	5300	2170
2.0	117	134	1.1	129000	260000	5000	5300	3080
2.6	120	149	2.0	190000	310000	4500	4800	2320
2.0	122	139	1.1	132000	270000	5300	6000	3170
2.9	127	158	2.0	220000	360000	4800	5300	2500
2.3	133	155	1.1	176000	340000	4500	5300	3200
3.1	137	168	2.0	232000	390000	4300	5000	2700

超精密圆柱滚子轴承
Precision Cylindrical Roller Bearings



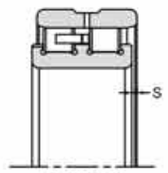
NN30

NNU49

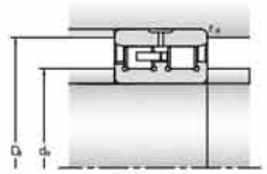
尺寸表 · 单位：mm
Dimenisons Unit:mm

轴承 Designation	质量 Weight m=kg	尺寸 Demension d	D	B	r_1 min	E	F	n_1	d_a
NNU4926KW33	3.73	130	180	50	1.5	–	146	6.5	3.2
NN3026KW33	5.79	130	200	52	2.0	182	–	9.5	4.8
NNU4928KW33	4.04	140	190	50	1.5	–	156	6.5	3.2
NN3028KW33	6.22	140	210	53	2.0	192	–	9.5	4.8
NNU4930KW33	6.1	150	210	60	2.0	–	168.5	6.5	3.2
NN3030KW33	7.58	150	225	56	2.1	206	–	9.5	4.8
NNU4932KW33	6.41	160	220	60	2.0	–	178.5	6.5	3.2
NN3032KW33	9.23	160	240	60	2.1	219	–	9.5	4.8
NNU4934KW33	6.73	170	230	60	2.0	–	188.5	6.5	3.2
NN3034KW33	12.5	170	260	67	2.1	236	–	9.5	4.8
NNU4936KW33	9.96	180	250	69	2.0	–	202	9.5	4.8
NN3036KW33	16.4	180	280	74	2.1	255	–	12.2	6.3
NNU4938KW33	10.4	190	260	69	2	–	212	9.5	4.8
NN3038KW33	17.3	190	290	75	2.1	265	–	12.2	6.3
NNU4940KW33	14.7	200	280	80	2.1	–	225	12.2	6.3
NN3040KW33	22.2	200	310	82	2.1	282	–	12.2	6.3
NNU4944KW33	15.9	220	300	80	2.1	–	245	12.2	6.3
NN3044KW33	29.1	220	340	90	3.0	310	–	15	8.0
NNU4948KW33	17.1	240	320	80	2.1	–	265	12.2	6.3
NN3048KW33	31.6	240	360	92	3.0	330	–	15	8.0
NNU4952KW33	29.7	260	360	100	2.1	–	292	15	8.0
NN3052KW33	46.2	260	400	104	4.0	364	–	15	8.0
NNU4956KW33	31.6	280	380	100	2.1	–	312	15	8.0
NN3056KW33	49.7	280	420	106	4.0	384	–	15	8.0
NNU4960KW33	49.1	300	420	118	3.0	–	339	17.7	9.5
NN3060KW33	68.8	300	460	118	4.0	418	–	17.7	9.5
NNU4964KW33	51.8	320	440	118	3.0	–	359	17.7	9.5
NN3064KW33	74.2	320	480	121	4.0	438	–	17.7	9.0

注：若需要本尺寸表中未列入的轴承，请与我们联系。
Note:If the bearings nost list here, please contact with us.



轴向位移
Axial displacement



安装尺寸
Abutment dimensions

轴向位移 Axial displacement s	安装尺寸 Abutment Dimensions $d_a h_{12}$	$D_a H_{12}$	r_{s1} max	基本额定载荷 Load Rating 动载荷 dyn Cr N	静载荷 sta C0 N	极限转速 Attainable Speed n_0 脂 Grease min^{-1}	n_0 油 Oil min^{-1}	径向刚度 Radial rigidity Rr KN/μm
2.7	145	166	1.5	190000	390000	4000	4800	3600
3.1	150	186	2.0	290000	500000	3800	4500	2980
1.8	155	176	1.5	190000	400000	3800	4500	3700
3.4	160	196	2.0	300000	520000	3600	4300	3090
2.7	167	197	2.0	325000	655000	3600	4300	4280
3.8	172	210	2.1	335000	585000	3400	4000	3300
2.7	177	207	2.0	335000	680000	3400	4000	4420
4.3	183	224	2.1	375000	670000	3200	3800	3510
2.7	187	217	2.0	340000	695000	3200	3800	4560
4.6	196	241	2.1	450000	800000	3000	3600	3770
3.2	200	232	2.0	405000	850000	3000	3600	5160
4.8	209	260	2.1	570000	1000000	2800	3400	4040
3.2	210	242	2.0	405000	880000	2800	3400	5310
4.8	219	271	2.1	585000	1040000	2600	3200	4190
4.3	223	259	2.1	490000	1040000	2600	3200	5510
5.7	232	288	2.1	655000	1200000	2400	3000	4410
4.3	243	279	2.1	510000	1140000	2400	3000	6000
5.7	254	317	3.0	800000	1460000	2200	2800	4770
4.3	263	299	2.1	530000	1200000	2200	2800	6320
6.1	274	337	3.0	850000	1560000	2000	2600	5140
5.4	289	334	2.1	750000	1700000	2000	2600	7080
6.6	300	372	4.0	1060000	2000000	1900	2400	5680
5.4	309	354	2.1	765000	1800000	1900	2400	7480
6.9	320	392	4.0	1080000	2080000	1800	2200	5890
6.3	336	389	3.0	1040000	2400000	1700	2000	8280
7.5	346	427	4.0	1270000	2400000	1600	1900	5930
6.3	356	409	3.0	1060000	2550000	1600	1900	8750
8.0	366	447	4.0	1320000	2600000	1600	1900	6440

圆锥滚子轴承
Precision Tapered Roller Bearings

MONTON

● Tapered Roller Bearings

代号例 Bearings Designation system:

3 | 02 | 26 | P5

轴承类型代号
Bearings Type
3 - 圆锥滚子轴承
3- Tapered Roller Bearings

尺寸系列代号
Dimension series
02 – GB/T297–1994的02系列
02-02series
20 – GB/T297–1994的20系列
20- 20Seires
23 – GB/T297–1994的29系列
23- 23series

公差等级代号
Precision degree
P5 – GB/T307.1–2005的5级
P5 precision degree
P4 – GB/T307.1–2005的4级
P4 precision degree

内径代号
Bore Diameter
轴承内径 = 内径代号 x 5mm
即内径为26 x 5 = 130mm
ID=bore code × 5
Ex: bore=26
ID=26 × 5=130mm

圆锥滚子轴承具有圆锥内圈和外圈，圆锥滚子排列在它们之间，使滚子的表面在轴承的轴相交。这些轴承的独特之处在于，不像大多数轴承可以处理轴向或径向负荷，他们可以处理两个方向的大量负荷。

Tapered roller bearings feature tapered inner and outer ring raceways with tapered rollers arranged between them, angled so the surface of the rollers converge at theaxis of the bearing. These bearings are unique in that, unlike most bearings that can handle either axial or radial loads, they can handle large amounts of load in both directions.

圆锥滚子轴承通常可以分解成独立的部件。带有滚子和保持架组件的内环可以从外环上拆卸和单独安装。圆锥滚子轴承适应内圈相对于外圈的角偏差的能力被限制在几分的弧内。与其他滚子轴承一样，圆锥滚子轴承必须给予最小的负载，特别是在高速应用中，否则惯性力和摩擦可以在滚子和滚道之间产生破坏性影响。

Tapered roller bearings can usually be broken down into separate parts. The inner ring with a roller and cage assembly can be removed and mountedseparately from the outer ring.The ability of a tapered roller bearing to accommodate angular misalignment of the inner ring in relation to the outer ring is limited to a few minutes of arc. As with other roller bearings, tapered roller bearings must be given a minimum load, especially in high speed applications where the inertial forcesand friction can have a damaging effect between the rollers and raceway.

产品特点Features:

1.优质经淬硬的轴承钢 High quality through hardened bearing steel
2.优化内部设计 Optimized, engineered internal geometry
3.高一致性，可靠灵活制造 Highly consistent, reliable, and flexible manufacturing
4.可互换的设计 interchangeable metric designs

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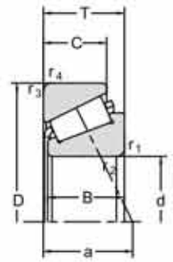
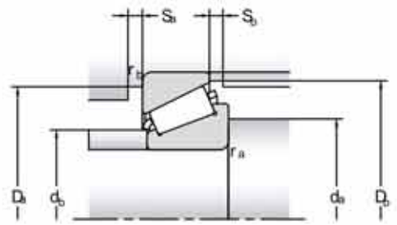
圆锥滚子轴承
Tappered Roller Bearing





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	外形尺寸 Dimension								安装尺寸 Abutment Dimension	
	d	D	B	C	T	a≈	r_1、r_2	r_3、r_4	da	db
	mm								min	max
32004	20	42	15	12	15	10	0.6	0.6	25	25
32005	25	47	15	11.5	15	12	0.6	0.6	30	30
32006	30	55	17	13	17	14	1.0	1.0	35	36
32007	35	62	18	14	18	15	1.0	1.0	40	41
32008	40	68	19	14.5	19	15	1.0	1.0	46	46
32009	45	75	20	15.5	20	17	1.0	1.0	51	51
32010	50	80	20	15.5	20	18	1.0	1.0	56	56
32011	55	90	23	17.5	23	20	1.5	1.5	63	62
32012	60	95	23	17.5	23	21	1.5	1.5	67	67
32013	65	100	23	17.5	23	23	1.5	1.5	72	72
32014	70	110	25	19	25	24	1.5	1.5	77	78
32015	75	115	25	19	25	25	1.5	1.5	82	83
32016	80	125	29	22	29	27	1.5	1.5	87	89
32017	85	130	29	22	29	28	1.5	1.5	92	94
32018	90	140	32	24	32	30	2.0	1.5	99	100
32019	95	145	32	24	32	32	2.0	1.5	104	105
32020	100	150	32	24	32	33	2.0	1.5	109	109
32021	105	160	35	26	35	35	2.5	2.0	115	116
32022	110	170	38	29	38	37	2.5	2.0	120	122
32024	120	180	38	29	38	40	2.5	2.0	130	131
32026	130	200	45	34	45	44	2.5	2.0	140	144
32028	140	210	45	34	45	46	2.5	2.0	150	153
32030	150	225	48	36	48	50	3.0	2.5	162	164
32032	160	240	51	38	51	53	3.0	2.5	172	175
32034	170	260	57	43	57	57	3.0	2.5	182	187
32036	180	280	64	48	64	60	3.0	2.5	192	199
32038	190	290	64	48	64	63	3.0	2.5	202	209
32040	200	310	70	53	70	67	3.0	2.5	212	221
32044	220	340	76	57	76	71	4.0	3.0	234	243
32952	260	360	63.5	48	63.5	69.6	3.0	2.5	272	279

安装尺寸 Abutment Dimension					额定载荷 Load rating		极限转速 Attainable speed		重量 Weihgt	轴承 Designation
Da		Db	Sa	Sb	Cr	Cor	脂 Grease	油 Oil	≈	
min	max	min	min	min	KN		r/min		kg	
36	37	39	3	3.0	24	29	8500	12000	0.1	32004
40	42	44	3	3.5	26.5	34	8000	11000	0.1	32005
48	49	52	3	4.0	39	47.5	6700	9000	0.17	32006
54	56	59	4	4.0	46.5	58.5	6000	8000	0.22	32007
60	62	65	4	4.5	54	71	5300	7000	0.29	32008
67	69	72	4	4.5	61	86.5	4800	6300	0.33	32009
72	74	77	4	4.5	64	95	4500	6000	0.42	32010
81	83	86	4	5.5	81.5	118	4000	5300	0.58	32011
85	88	91	4	5.5	83	125	3800	5000	0.63	32012
90	93	97	4	5.5	83	129	3400	4500	0.63	32013
98	103	105	5	6.0	106	163	3200	4300	0.97	32014
103	108	110	5	6.0	108	170	3000	4000	0.93	32015
112	117	120	6	7.0	137	212	2600	3600	1.24	32016
117	122	125	6	7.0	143	228	2400	3400	1.31	32017
125	131	134	6	8.0	166	255	2200	3200	1.69	32018
130	136	140	6	8.0	173	275	2200	3200	1.79	32019
134	141	144	6	8.0	176	285	2000	3000	1.93	32020
143	150	154	6	9.0	204	335	1900	2800	2.33	32021
152	160	163	7	9.0	240	400	1800	2600	2.96	32022
161	170	173	7	9.0	250	425	1700	2400	3.28	32024
178	190	192	8	11.0	335	560	1600	2200	5.05	32026
187	200	202	8	11.0	345	610	1600	2200	5.18	32028
200	213	216	8	12.0	390	695	1500	2000	6.31	32030
213	228	231	8	13.0	425	750	1300	1800	7.78	32032
230	248	249	10	14.0	465	800	1200	1700	10.6	32034
247	268	267	10	16.0	630	1100	1100	1600	14.2	32036
257	278	279	10	16.0	640	1140	950	1400	14.8	32038
273	298	297	11	17.0	765	1370	900	1300	18.9	32040
300	326	326	12	19.0	702	1330	800	1000	22.3	32044
325	348	347	11	15.0	688	1470	700	900	18.6	32952

注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

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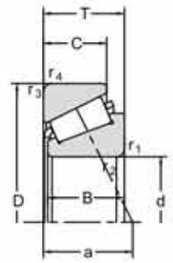
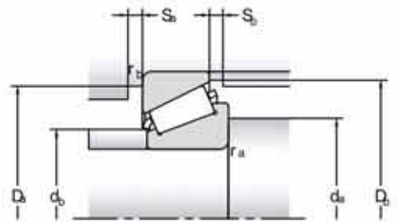
圆锥滚子轴承
Tappered Roller Bearing





尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	外形尺寸 Dimension								安装尺寸 Abutment Dimension		安装尺寸 Abutment Dimension				额定载荷 Load rating		极限转速 Attainable speed		重量 Weihgt	轴承 Designation
	d	D	B	C	T	a≈	r_1、r_2	r_3、r_4	da	db	Da		Db	Sa	Sb	Cr	Cor	脂 Grease	油 Oil	≈	
	mm								min	max	min	max	min	min	min	KN		r/min		kg	
30205	25	52	15	13	16.25	12.5	1.0	1.0	31	31	44	46	48	2	3.5	32.2	37.0	7000	9000	0.154	30205
30206	30	62	16	14	17.25	13.8	1.0	1.0	37	37	53	56	57	2	3.5	34.2	50.5	6000	7500	0.231	30206
30207	35	72	17	15	18.25	15.3	1.5	1.5	44	44	62	65	67	3	3.5	54.2	63.5	5300	6700	0.331	30207
30208	40	80	18	16	19.75	16.9	1.5	1.5	49	49	69	73	74	3	4.0	63.0	74.0	5000	6300	0.422	30208
30209	45	85	19	16	20.75	18.6	1.5	1.5	54	54	74	78	80	3	5.0	67.8	83.5	4500	5600	0.474	30209
30210	50	90	20	17	21.75	20.0	1.5	1.5	58	58	79	83	85	4	5.0	73.2	92.0	4300	5300	0.529	30210
30211	55	100	21	18	22.75	21.0	2.0	1.5	64	64	88	91	94	4	5.0	90.8	115	3800	4800	0.713	30211
30212	60	110	22	19	23.75	22.3	2.0	1.5	70	70	96	101	103	4	5.0	102	130	3600	4500	0.904	30212
30213	65	120	23	20	24.75	23.8	2.0	1.5	77	77	106	111	113	4	5.0	120	152	3200	4000	1.13	30213
30214	70	125	24	21	26.75	25.8	2.0	1.5	81	81	110	116	118	4	5.5	132	175	3000	3800	1.26	30214
30215	75	130	25	22	27.75	27.4	2.0	1.5	84	86	115	121	124	4	5.5	138	185	2800	3600	1.36	30215
30216	80	140	26	22	28.75	28.1	2.5	2.0	90	91	124	130	133	4	6.0	160	212	2600	3400	1.76	30216
30217	85	150	28	24	30.5	30.3	2.5	2.0	95	97	132	140	141	5	6.5	178	238	2400	3200	2.06	30217
30218	90	160	30	26	32.5	32.3	2.5	2.0	100	103	140	150	151	5	6.5	200	270	2200	3000	2.54	30218
30219	95	170	32	27	34.5	34.2	3.0	2.5	107	109	149	158	160	5	7.5	228	308	2000	2800	3.04	30219
30220	100	180	34	29	37	36.4	3.0	2.5	112	115	157	168	169	5	8.0	255	350	1900	2600	3.72	30220
30221	105	190	36	30	39	38.5	3.0	2.5	117	122	165	178	178	6	9.0	285	398	1800	2400	4.38	30221
30222	110	200	38	32	41	40.4	3.0	2.5	122	129	174	188	188	6	9.0	315	445	1700	2200	5.21	30222
30224	120	215	40	34	43.5	44.1	3.0	2.5	132	140	187	203	202	6	9.5	338	482	1500	1900	6.20	30224
30226	130	230	40	34	43.75	46.1	4.0	3.0	144	152	203	216	218	7	10.0	365	520	1400	1800	6.94	30226
30228	140	250	42	36	45.75	49.0	4.0	3.0	154	163	219	236	235	9	11.0	408	585	1200	1600	8.73	30228
30230	150	270	45	38	49	52.4	4.0	3.0	164	175	234	256	251	9	11.0	450	645	1100	1500	10.8	30230
30232	160	290	48	40	52	55.5	4.0	3.0	174	189	252	276	270	9	12.0	512	738	1000	1400	13.3	30232
30234	170	310	52	43	57	60.4	5.0	4.0	188	201	269	292	290	9	14.0	590	865	1000	1300	16.6	30234
30236	180	320	52	43	57	62.8	5.0	4.0	198	209	278	302	399	9	14.0	610	912	900	1200	17.3	30236
30238	190	340	55	46	60	65.0	5.0	4.0	208	223	398	322	320	9	14.0	698	1030	850	1100	20.8	30238
30240	200	360	58	48	64	69.3	5.0	4.0	218	235	315	342	338	9	16.0	765	1140	800	1000	24.7	30240

注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

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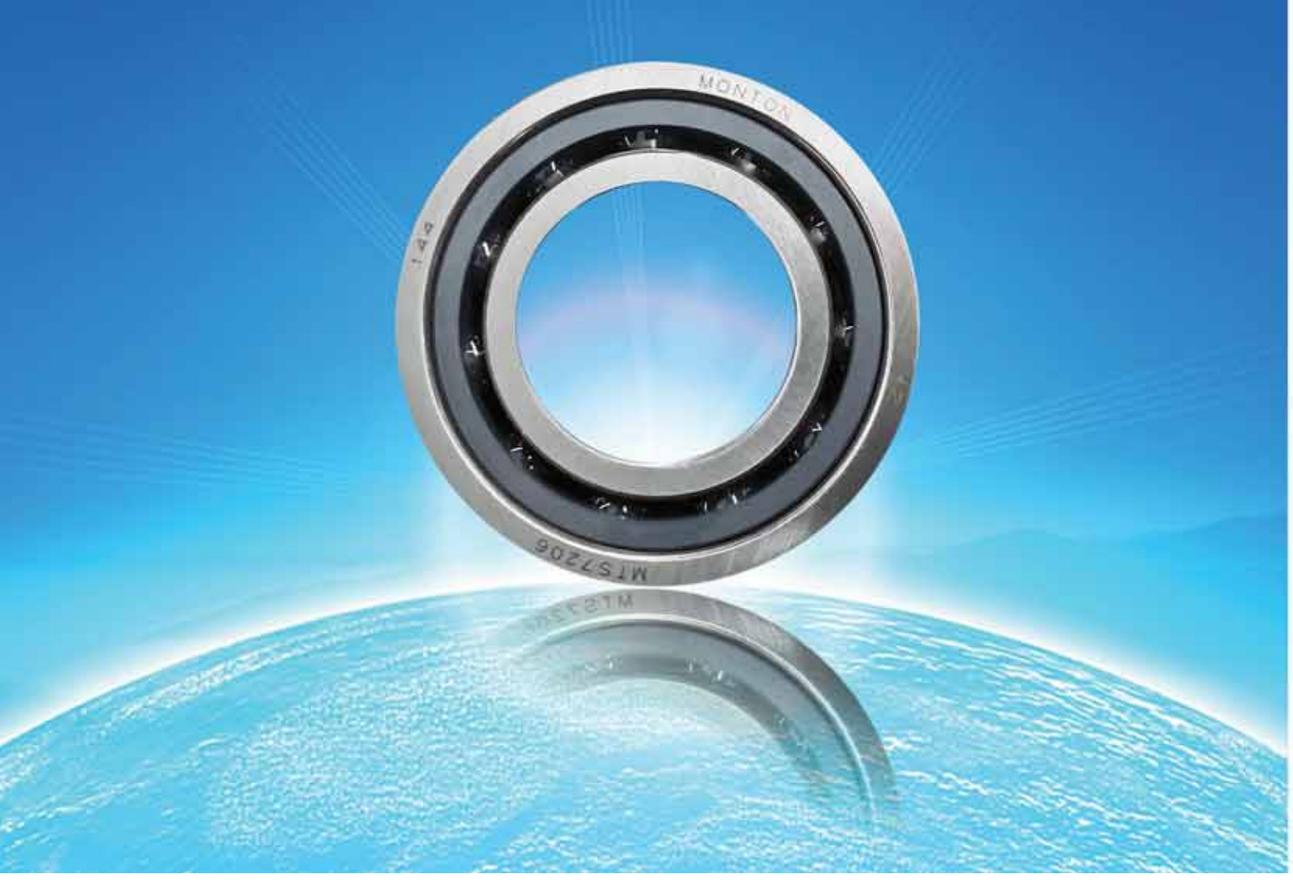
低温轴承
Low temperature bearing



●LNG泵低温轴承
LNG pump Low temperature bearing

LNG（液化天然气）泵用于接收液化天然气并将其排放至道路罐车和储罐。在这种应用中，轴承的工作条件非常恶劣，工作温度可以达到-196° C，并且轴承必须在没有外部润滑的情况下运行。盟拓在液化天然气泵轴承方面不仅可以提供深沟球轴承，也可以提供角接触球轴承。

LNG (Liquefied Natural Gas) pumps are used for receiving and discharging LNG to road tankers and storage tanks. In this application the bearing operating conditions are very tough, as the temperature can reach −196°C, and the bearing has to run without external lubrication.MONTON LNG pump bearings are available not only as deep groove ball bearings but also angular contact ball bearings.

工作环境	Working situation
恶劣的环境	Arduous Environments
腐蚀环境	Corrosive Environment
高速	High Speed
低温	Low Temperature
无润滑	Without Lubrication

低温设备用轴承特点 Characteristics of low temperature bearings for equipment

工况条件复杂 Complex working conditions

1.输送介质中含有杂质 The conveying medium contains impurity

2.输送介质中常有腐蚀性 Corrosive substances often contain conveying media

3.输送介质中含有水气 The conveying medium contains water vapor

4.有时需防磁 Anti magnetic needed sometimes

润滑环境恶劣 Bad lubrication environment

1.运转过程中无润滑剂 Without lubricant during operation

2.轴承需具备自润滑性 Bearings must be self-lubricating

3.轴承需高耐磨性 Bearings need good wear resistance

工作温度低 Low working temperature

1.液氧温度约−183℃ liquid-oxygen temperature around -183℃

2.液氮温度约−196℃ liquid nitrogen temperature around -196℃

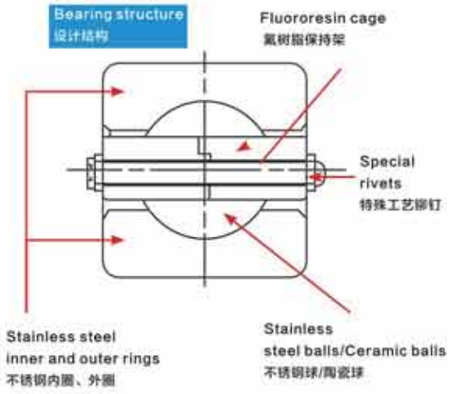
3.液氢温度约−253℃ Liquid hydrogen temperature around -253℃

可靠性要求高 Highly reliability

1.停机维护成本高 High costs of downtime and maintenance

2.停机维护损失较大 Large downtime maintenance loss

3.由于轴承失效造成的损失更大 Great losses due to bearing failure



6311 H T35D C3

Code 代号	Description 说明
6311	Basic bearing number 基本轴承代号
H	Stainless steel 不锈钢
T35D	Fluororesin cage 氟树脂保持架
C3	Radial clearance 径向游隙

低温轴承特点 Low temperature bearing characteristics

高精度 High Precision

1.套圈P2级加工工艺 P2 degree manufacturing technology

2.成品旋转精度P4级及以上 Finished product rotation accuracy equal or above P4

3.精确控制轴承游隙 Strictly control bearing clearance

高耐磨性及耐腐蚀性 High wear resistance and corrosion resistance

1.不锈钢或高氮不锈钢 Stainless steel or high nitrogen stainless steel

2.套圈表面特殊处理耐磨性提高 Special treatment on the surface of the ferrule to improve wear resistance

3.抵御介质中异物对轴承的损伤 Resist damage to the bearing caused by foreign objects in the medium

长寿命 Long life

1.内部结构优化 Optimized Internal structure

2.特殊热处理 Special heat treatment

3.疲劳极限大大提高 Greatly improved Fatigue limit

高可靠性 High reliability

1.最低使用温度低至−273℃ The lowest operating temperature as low as -273℃

2.自润滑性能优良 Excellent self-lubricating performance

3.无润滑条件下可靠运行 Reliable operation without lubrication

应用领域 Application

1.液化天然气泵 LNG pump

2.液化石油气泵 LPG pump

3.液氮泵 Liquid nitrogen pump

4.液氧泵 Liquid oxygen pump

5.其它低温液体泵 Other cryogenic liquid pumps

6.其它真空泵 Other vacuum pumps

适用介质 Applicable medium

LN2,LO2,LH2,LAr,LNG,CNG,LPG,液态甲烷（Liquid Methane Gas　液态乙烯（Liquid Ethylene

在低温应用中滚动轴承通常在最恶劣的环境下工作，其特点是温度远低于低于0° C环境温度且润滑不良，因为在接近绝对零度（0 K）。传统钢轴承的使用寿命短，不仅是计划维护周期短的主要根源，也是设备过早故障和计划外机器停机的主要原因。

In cryogenic applications rolling bearings very often operate in the harshest environment, characterized by temperature far below 0°C and poor lubrication, because the lubrication withoil and grease becomes a challenge at temperatures close to absolute zero (0 K). Small wonder then that conventional steel bearings provide short service life and are the main root cause not only for planned maintenance cycles but also premature equipment failures and unplanned machinery shutdowns.

我们的低温轴承规格采用 AISI 440C 或高氮钢制成的套圈。高氮钢具有出色的耐腐蚀性、耐磨性和抗疲劳性，尤其是与氮化硅陶瓷 (Si3N4) 滚动体结合使用。可提供Si3N4滚动体、球或滚子，通过其惰性行为防止粘着磨损，并显着减少磨料磨损和轴承摩擦。因此，混合轴承特别适用于介质润滑操作。聚酰胺 (PA) 和 PEEK 保持架在超低温下往往会变脆，而 LNG 泵轴承采用由含氟聚合物复合材料制成的保持架，保持韧性，提供自润滑，因此可在低至 −273° C 的温度下完美运行.

Our cryogenic bearing specification features rings either made from AISI 440C or High-Nitrogen-Steel. High-Nitrogen-Steel provides excellent resistance against corrosion, wear and fatigue, particularly in combination with silicon nitride ceramic (Si3N4) rolling elements. Si3N4 rolling bodies, balls or rollers are available, prevent adhesive wear by their inert behavior and significantly reduce abrasive wear and bearing friction. Thus hybrid bearings are especially qualified for media lubrication operation. While polyamide (PA)- and PEEK-cages tend to get brittle at ultra low temperature, LNG pump bearings feature retainers made from fluoropolymer compound material, which remains ductile, provides self-lubrication and hence operates perfectly at temperatures down to -273°C.

我们不仅特别注意所有轴承材料，而且使轴承内外圈适应低温环境。我们的轴承工程师在设计阶段考虑了所有材料（包括轴和轴承座）的不同热性能，以便我们的轴承提供优化的径向游隙或接触角，并在工作温度下与配合零件完美配合，这可以使轴承达到最大的负载能力和更长的轴承寿命。我们可根据要求提供定制的轴承尺寸和公差，即使是小批量也可以定制。

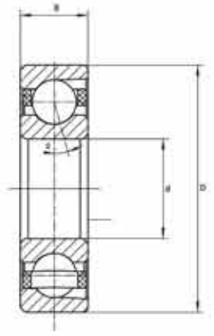
Our does not only pay careful attention to all bearing materials, but also adapts the inner and outer bearing geometry to the cryogenic environment. Our bearing engineers consider the different thermal properties of all materials, including shaft and housing, during the design phase, so that our bearings provide an optimized radial play or contact angle as well as perfect fits to the mating parts at operating temperature. This leads to maximized load capacity and superior bearing life. We offers customized bearing dimensions and tolerances on request, even in small quantities.

在液化气体泵（LNG、LN2、LO2、LH2、LHe2）中，滚动轴承直接设计在泵的流道中处理介质。这种设计原则的优点是，结构变得不那么复杂。旋转密封件不再需要将轴承与工艺介质分离并保护其不受影响的易损件。结果是，轴承必须能够处理各种液化气体，而液化气体是轴承的唯一润滑介质。需要特殊先进的轴承材料，以使轴承能够通过低温进行介质润滑，盟拓轴承长期工作使用证明低温轴承规范完美地反映了这些要求。

In Liquefied Gas Pumps (LNG, LN2, LO2, LH2, LHe2) rolling bearings are designed directly into the flow path of the process media. The advantage of this design principle is, that the construction becomes less complex. Rotary seals, which separate and protect the bearings from the process media, and which are typical wear parts, are no longer necessary. The trade-off is, that the bearings must be capable to cope with the various liquefied gases, which act as their only lubrication. Special advanced bearing materials are required to enable bearings for media lubrication by cryogenic liquids and MONTON's long time proven bearing specification for cryogenic temperature perfectly reflects these requirements.

盟拓公司在为低温行业提供液化气体泵用混合陶瓷轴承方面有着悠久的传统（LNG、LN2、LO2、LH2、LHe2）以及涡轮膨胀机、液体涡轮机和冷却器。盟拓低温轴承旨在满足提高生产率和降低维护成本的要求。经验丰富的轴承设计工程师很乐意咨询客户，为客户的低温旋转设备提升到新的性能水平。

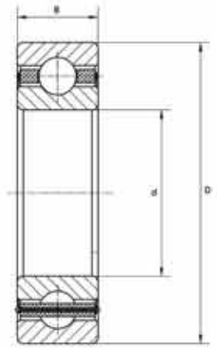
MONTON has a long experience in supplying hybrid ceramic bearings to the cryogenic industry, for Liquefied Gas Pumps (LNG, LN2, LO2, LH2, LHe2) but also Turbo Expanders, Liquid Turbines and Chillers.MONTON bearings for cryogenic applications are designed to fulfil the requests of improving productivity and cutting maintenance costs. Skilled MONTON bearing engineers are happy to consult customers to lift their cryogenic rotating equipment to the next performance level.



● 低温轴承 Low temperature bearing

尺寸表 · 单位：mm Dimenisons Unit:mm

轴承 Designation	内径	外径	厚度	倒角	载荷		极限速度
	Dimension				Loading (KN)		Limited Speed
	ID	OD	B	Chamfer	Cor	Cr	(r/min)
7205A5hU9	25	52	15	1	15	9	26000
7206A5hU9	30	62	16	1	22	14	22000
7207A5hU9	35	72	17	1.1	29	19	19000
7208A5hU9	40	80	18	1.1	30.5	21.6	17000
7209A5hU9	45	85	19	1.1	39	27.5	15000
7210A5hU9	50	90	20	1.1	40.5	30.5	14000
7305A5hU9	25	62	17	1.1	18.3	10.6	18000
7306A5hU9	30	72	19	1.1	24.8	15.4	15000
7307A5hU9	35	80	21	1.5.	30.6	19.6	14000
7308A5hU9	40	90	23	1.5	37	24.4	12600
7309A5hU9	45	100	25	1.5	47.6	31.8	12000
7310A5hU9	50	110	27	2	54.6	39.2	10000
7311A5hU9	55	120	29	1	58	845.6	9000



轴承 Designation	内径	外径	厚度	倒角	载荷		极限速度
	Dimension				Loading (KN)		Limited Speed
	ID	OD	B	Chamfer	Cor	Cr	(r/min)
6205-H-T35D	25	52	15	1	14	7.8	17000
6206-H-T35D	30	62	16	1	19.3	11.2	14000
6207-H-T35D	35	72	17	1.1	25.5	15.3	12000
6208-H-T35D	40	80	18	1.1	29	18	11000
6209-H-T35D	45	85	19	1.1	31	20.4	10000
6210-H-T35D	50	90	20	1.1	36.5	24	9500
6211-H-T35D	55	100	21	1.5	43	29	8500
6213-H-T35D	65	120	23	1.5	58	41.5	7000
6215-H-T35D	75	130	25	1.5	64	48	6800
6217-H-T35D	85	150	28	2	82.5	62	6500
6220-H-T35D	100	180	34	2.1	122	93	5400
6222-H-T35D	110	200	38	2.3	144	117	3000
6304-H-T35D	20	52	15	1.1	15.2	8	24000
6305-H-T35D	25	62	17	1.1	22	11	22000
6308-H-T35D	40	90	23	1.5	42.5	25	11000
6311-H-T35D	55	120	29	2	76	47.5	10000
6314-H-T35D	70	150	25	2.1	102	66	9000
6318-H-T35D	90	190	43	3	132	100	6000
6320-H-T35D	100	215	47	3	160	130	5700
6322-H-T35D	110	240	50	3	190	165	5400
6328-H-T35D	140	300	62	4	255	250	4000

注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

●电机轴承

Servo motor bearing

高速伺服电机轴承特点：密封性好，具有高稳定性，优选金属材质,经过特殊的热处理工艺、制造装备和技术,使精密深沟球轴承的使用寿命大大增加,支持高速运转,降低成本,提高效率。

Servo motor bearing features: good sealing, high stability, metal material is preferred. Through special heat treatment process, manufacturing equipment and technology, the service life of precision deep groove ball bearing is greatly increased, supporting high-speed operation, reducing cost and improving efficiency.

产品特点

卓越的氧化性和热稳定性
优良的防锈性能
低噪音

Product Features

Exceptional oxidation and heat stability
Excellent rust prevention
Low noise

优 点

卓越的润滑脂性能可延长使用寿命1.5倍
扭矩低/功率损失最小
由于振动较小，伺服电机运行更安静
在潮湿的条件下表现良好

Benefits

Superior grease properties extend service life 1.5x's
Low torque/minimal power loss
Quieter servomotor operation due to less vibration
Excellent in humid conditions

应用环境

腐蚀环境
高精度
低振动

Condition Description

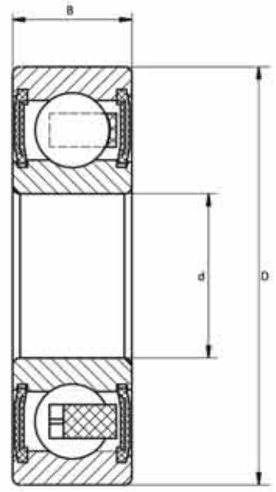
Corrosive Environment
High Accuracy
Low Vibration

应用行业

电机
机床
钻床主轴电机
FANUC伺服电机
西门子伺服电机
离心机

Industries

Electric Motors
Machine Tools
spindle motor of drilling machine
FANUC servo motor
Siemens Servo motor
centrifuge



尺寸表 · 单位：mm Dimenisons Unit:mm

型号	混合陶瓷球	内径	外径	高度
Bearing	Ball	d	D	B
6205VV-2RS/P4	Ceramic ball	25	52	15
B25-254-2RS/P4	Ceramic ball	25	52	20.6
B25-224-2RS/P4	Ceramic ball	25	62	16
EPB50-67-2RS/P4	Ceramic ball	50	130	31
EPB60-47-2RS/P4	Ceramic ball	60	130	31
B40-180-2RS/P4	Ceramic ball	40	90	23
B40-185-2RS/P4	Ceramic ball	40	80	30
B40-188-2RS/P4	Ceramic ball	40	80	18
B40-166-2RS/P4	Ceramic ball	40	90	23
B40-160-2RS/P4	Ceramic ball	30	72	19
F-568217-2RS/P4	Ceramic ball	35	72	23
F-568240-2RS/P4	Ceramic ball	40	80	23
F-568241-2RS/P4	Ceramic ball	40	90	23
F-563087-2RS/P4	Ceramic ball	50	90	23
F-563088-2RS/P4	Ceramic ball	50	110	23
F-563091-2RS/P4	Ceramic ball	60	110	28
F-567384-2RS/P4	Ceramic ball	50	110	23

注：若需要本尺寸表中未列入的轴承，请于我们联系。
Notice: If the bearings not lsit here, please contact with us for details.

特种轴承
Special bearings

真空泵轴承
Vacuum Pump Bearing

For turbomolecular pumps and dry pumps, bearings are required to have long service life, reliability, and high rotational speed;
The inner and outer ring materials of vacuum pump bearings are made of X-life Cronidur30 high nitrogen stainless steel, combined with special heat and cold treatment processes. The rolling element adopts high-performance hot isostatic pressing ceramic balls, and the higher precision raceway is processed, which makes bearings exhibit amazing performance in high temperature, high speed, low vibration, high pollution, insufficient lubrication, high reliability, and long service life. vacuum pump bearings can operate continuously for more than 30000 hours with a DmL value ≤ 500000.

航天轴承

Aerospace bearings

As a key component in spacecraft, the stability and reliability of the performance of space bearings are directly related to the operational safety and mission success of spacecraft. In the aerospace field, aerospace bearings are widely used, involving satellites, rockets, space stations and other aspects. MONTON Precision Bearing will discuss the application cases of aerospace bearings in the aerospace field and look forward to its future development prospects.

盖米特轴承

GAMET Super Precision Tapered Roller Bearings

The geometry of tapered roller bearings provides certain unique features: most importantly, the long line contact between roller and race gives high load carrying capacity and high bearing stiffness. The 'on apex' design ensures a true rolling motion of the rollers on the raceways, at every point along the roller body. See Fig 1. In addition, the tapered construction allows the bearing to carry combinations of radial and thrust load. The small seating force (x) produced at the rib aligns the rollers to prevent skewing.

高线轧线轴承

High Speed Wire Rolling Mill Bearings

The wire Rolling Mill Bearings must meet continuous operation requirements under High-Speed and high-impact conditions. Therefore, making bearings that can withstand constant production and the prohibition of bearing damage becomes a critical standard for the manufacturers which produce bearings for high-speed wire rolling mills.

Rolling bearings in wire rod rolling mills are used for the safe and accurate bearing arrangement of shafts, axles and bevel gearboxes. High speeds and dynamic loads represent a major challenge here. Depending on the shape and temperature of the rolled material, the initial peak loads are more than twice the rolling force or rolling mill torque. The result is a significant raise in the service life of the rolling bearings.

In order to ensure the durable and safe operation of the wire rod rolling equipment, high-precision special bearings are used that can absorb the forces that occur, and guarantee low-friction and low-vibration rotation with the components. MONTON bearings produce with accuracy standards P5–P2 especially for this demanding application. In doing so, long, expensive down times are avoided, while a high quality of rolled products is achieved.

Type	Bearing	Morgan bearing type
Cylindrical roller bearing	F0182293 – 804753	N226E.M1
	F0364021 – 801680	162250–GA (MR126KC4/8/11)
	F0364023 – 801681	162250–H (MR312C–1/2/4) 162250–HA (MR312C–3/5)
	F0364029 – 803156	162250–G (MR126KC–1/3/7/10, N–1026–VAA, U1026EMR103, X–4567–RBEC5)
	F0364032 – 801682	162250–GC (R126KC–2/4/6)
	F0364035 – 804569	162250–F (U–1024–EMR–304/305, N–1024–VAA, 804235/A)
	F0364037 – 804623	162250–D (MCS–128–107, N–228–VAA)
	F0364038 – 801680D	162250–GD (MR126KC–6/9, R126KC–3/5/7)
	F0364046 – 804809	162250–V (MR228 C1, U–1228–EMR–302, N–228 AA)
	F0364047 – 804811	162250–B (MCS140–106, MCS140–106–CD, N–140–VAA)
	F0364048 – 804810	162250–S (MCS134–104, MCS134–104–CD, N–134–VAA)
	F5795831 – NU 1040 M1.C3	––
	F5795832 – NU 234 E.MPA.P63	––
	F5795836 – NU 1034 MPA P63	––
	F7590361	M438106D
	F0364051 – 807124	162250–HB (R312C–7/11)
	F0364055 – 807722	MEERdrive®PLUS (FRS*/SIZING Mill)
	N226	N 226 E.M1.C3
	F0364025	––
Tapered roller bearing	F7380805	162250–KC (CONE–462–CUP–452 DX2S–462EP.008)
Angular contact ball bearing	F0364022 – 801684	162250–Y (7126KRD–2/4S)
	F0364024 – 801686	162250–K (309RD–3/4/5/6/9B)
	F0364027– 801685	MEERdrive®PLUS (FRS*/SIZING Mill)
	F0364028 – 800821	162250–LB (7307PD–3/4/8F)
	F0364031 – 800820A	162250–MB (7310PD–4/8S) 162250–J (7310PD–2/3/4/5/7/8B, 7310PD–4B)
	F0364033 – 804237	162250–C (7226–D2/3/–Spec./6/7/8/9B)
	F0364034 – 804236	162250–E (7224, 7224D–3/5/6/9B)
	F0364042 – 804712	162250–LA (7309PD–5/7F)
	F0364043 – 804974	162250–MA (MRC5310; MRC5311–5/C2, BA2B–475882)
	F0364044 – 804973	162250–M (MRC5310–8/C2, BA2B–475881)
	F0364050 – 804864	162250–L (5308–9, 7208PD, 7208PD4/5F)
	F0364052 – 807123	162250–JA (7311PD–2/3/6/9B)
	F7590362	M438106C
	7220 BMP. UA	M438106A
	––	––
Deep–groove ball bearing	F0364041 – 6034 MA.P64	162250–U (134–KS, 134–KS–1)
	F0364045 – 6028 MA.P54	162250–X (9128, 9128 KS1/–2)
	F0364054 – 807122	162250–W (MRC228S, BB1B–447022)
	F6553616 – 208–MZZ–ST, 6208.2 RSR	162250–N (6208–2RS1/W64CVK121)
	F0364053 – 807121	162250–KA (309S–26, 309S–34)
Four–point bearing	F5795833	QJ 234 N2 MPA.C3

涡喷发动机轴承

Turbojet Engine Bearing

MONTON can supply full series and ceramic ball turbojet bearings for the model gas jet turbine fraternity.

Introduction:
Inner and outer ring material: All models are made of high nitriding stainless steel (X30N material)
Ball material: SI3N4 ceramic ball High-performance ceramic ball roller
Cage: full ball or high strength alloy steel surface silver plated cage
Heat treatment : special heat treatment and cold treatment process
Bearing type: Full ball no cage angular contact bearing
Accuracy: P4 or P2
Single bearing up to the limit speed: 156,000 RPM,200,000 RPM (oil lubrication)
Lubrication: jet aviation kerosene lubrication while reducing the temperature
Working temperature: 250-450 degrees Celsius Application conditions: short time high-speed high temperature operation model jet engine.

直润滑角接触球轴承

Direct Lubricated angular contact ball bearings

Direct Lube angular contact ball bearings lubricating oil is routed straight to a point right by the working surfaces on the outer ring via a circular groove and a through–hole in the outer ring. This guarantees a reliable, even supply of lubricant, enabling rotational speeds of over 3 million D_mN .

In addition, two O–rings in the outer ring ensure that the through–hole in the housing is securely sealed. This means that any fit can be selected, depending on the application. Because there are no injection nozzles between the bearings, very compact spindles can be designed. As the Direct Lube angular contact ball bearings have the same dimensions as greaselubricated bearings, it is easier to use spindle components as modules for various spindle series.

This increases cost–effectiveness for spindle manufacturer.

MONTON

技术指南
Technical Guide

MONTON

Technical Guide

1. Life

Rolling Fatigue Life and Basic Dynamic Load Rating

Bearing Life

The functions required of rolling bearings vary according to the bearing application, and these functions must be performed for a prolonged period. Even if bearings are properly mounted and correctly operated, they will eventually fail to perform satisfactorily due to an increase in noise and vibration, loss of running accuracy, deterioration of grease, or fatigue flaking of the rolling surfaces. In the broad sense of the term, bearing life refers to the period during which bearings continue to operate and satisfy their required functions. Depending on the cause of bearing failure, this bearing life may be defined as:

- noise life
- grease life
- rolling fatigue life

Besides natural deterioration, bearings may fail due to:

- heat seizure
- fracture or cracks
- wear
- rings becoming scored
- damaged seals

If the bearing fails for such reasons, this should not be interpreted as normal bearing life because these failures often occur as a result of selecting the wrong bearings, improper design or manufacture of the bearing surroundings, incorrect mounting, or insufficient maintenance.

Rolling Fatigue Life and Basic Rating Life

When rolling bearings are operated under load, the raceways of their inner and outer rings and rolling elements are subjected to repeated cyclic stress. The rolling contact surfaces of the raceways and rolling elements experience metal fatigue, and scaly particles may separate from the bearing material in a phenomenon called “flaking”. Rolling fatigue life is represented by the total number of revolutions at which the bearing surface will start flaking due to stress. Rolling fatigue life is often also called “bearing life” when the term is used in a more narrow sense.

Even for seemingly identical bearings of the same type, size, and material that receive the same heat treatment and other processing, the rolling fatigue life varies greatly, even under identical operating conditions. This is because the flaking of materials due to fatigue is subject to many other variables. Consequently, the concept of “basic rating life”, in which rolling fatigue life is treated as a statistical phenomenon, is used in preference to actual rolling fatigue life.

Suppose a number of bearings of the same type are operated individually under the same conditions. After a certain period, 10% of them will fail as a result of flaking caused by rolling fatigue. The total number of revolutions at this point is defined as the basic rating life. If the speed is constant, the basic rating life is often expressed by the total number of operating hours completed when 10% of the bearings become inoperable due to flaking.

In determining bearing life, basic rating life is often the only factor considered. However, other factors must also be taken into account. For example, it is possible to approximate the grease life of bearings prelubricated with grease. Since noise life and abrasion life are determined according to individual standards for different applications, specific values for noise or abrasion life have to be determined empirically.

Basic Dynamic Load Rating

The basic dynamic load rating applies to bearings with stationary outer rings and rotating inner rings. It is defined as the constant load that the bearing can endure for a rating life of one million revolutions (10^6 rev). For radial bearings, the basic dynamic load is given as a central radial load in a constant direction and magnitude, while the basic dynamic load rating of thrust bearings is given as an axial load of constant magnitude in the same direction as the central axis. The basic dynamic load ratings are listed in the bearing tables under C_r for radial bearings and C_a for thrust bearings.

The basic dynamic load rating of multi-row bearing arrangements can be calculated using the following formula:

for ball bearings: $C_j = j^{0.7} \times C_1$

for roller bearings: $C_j = j^{7/9} \times C_1$

where j : Number of rows ($j \geqq 2$)
C_1 : Basic dynamic load rating for single-row bearings
C_j : Basic dynamic load rating for multi-row bearings (where j is the number of rows)

Special care must be taken when calculating the basic dynamic load rating C_a for thrust bearings, as j refers to the number of rows sustaining axial load only. For example, only two rows sustain the axial load in a four-row DBB arrangement; thus $j = 2$.

Basic Rating Life

The following relationships exist between basic dynamic load rating, dynamic equivalent load, and basic rating life:

MONTON

for ball bearings: $L_{10} = \left(\frac{C}{P}\right)^3$ (10^6 rev)

$L_{10} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3$ (h)

for roller bearings: $L_{10} = \left(\frac{C}{P}\right)^{10/3}$ (10^6 rev)

$L_{10} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^{10/3}$ (h)

P : Dynamic equivalent load (N)
C : Basic dynamic load rating (N)
n : Rotational speed (min^{-1})

For bearings that run at a constant speed, it is convenient to express the fatigue life in terms of hours.

Dynamic Equivalent Load

In some cases, the loads applied on bearings are purely radial or axial loads; however, in most cases, the loads are a combination of both. In addition, such loads usually fluctuate in both magnitude and direction.

In such cases, the loads actually applied to bearings cannot be used for bearing life calculations; therefore, a hypothetical load should be estimated that has a constant magnitude, passes through the center of the bearing, and achieves the same bearing life as the bearing would attain under actual conditions of load and rotation. Such a hypothetical load is called the dynamic equivalent load.

Assuming the equivalent radial load as P_r, the radial load as F_r, the axial load as F_a, and the contact angle as α, the relationship between the equivalent radial load and bearing load can be approximated as follows:

$$P_r = XF_r + YF_a$$

where: X : Radial load factor
Y : Axial load factor
} see Table 1.1

The axial load factor varies depending on the contact angle. For roller bearings, the contact angle remains the same regardless of the magnitude of the axial load. In the case of single-row deep groove ball bearings and angular contact ball bearings, the contact angle increases when the axial load is increased. Such change in the contact angle can be expressed by the ratio of the basic static load rating C_{0r} and the axial load F_a. Table 1.1 shows the axial load factor at the contact angle corresponding to this ratio. Regarding angular contact ball bearings, if the contact angle is 25°, 30°, or 40°, the effect of contact angle change on the load factor may be ignored under normal operating conditions.

For thrust bearings with contact angles of $\alpha \neq 90°$ that receive both radial and axial loads simultaneously, the equivalent axial load P_a becomes as follows:

$$P_a = XF_r + YF_a$$

Relationship between Bearing Life and Contact Angle

When a load is applied to an angular contact ball bearing, the amount of stress at the contact point changes as a result of the varying load conditions of the balls, inner ring, and outer ring relative to the contact angle of the bearing.

Figure 1.1 illustrates loads acting on two rolling elements at a 30° contact angle and a 15° contact angle.

The relationship between an axial load applied to the bearing and the resulting load acting on the rolling element can be formulated as:

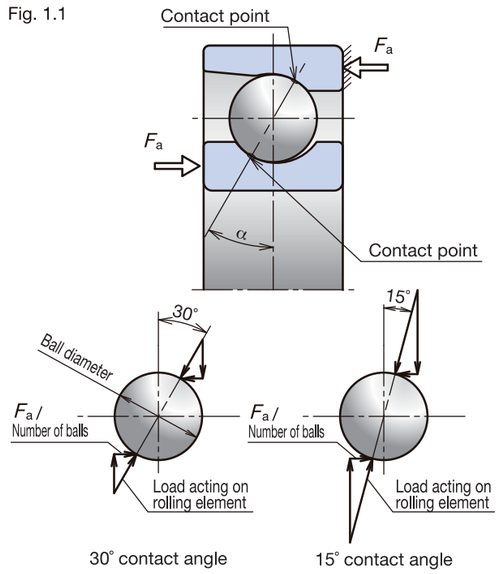
Load on rolling element = $Fa/(\text{number of balls} \times \sin\alpha)$.

Therefore, the larger the contact angle, the smaller the load acting on the rolling element. The load at the contact point and its consequential deformation are reduced, thus resulting in longer life.

When a radial load is applied, the smaller the contact angle, the smaller the load acting on the rolling element. This results in reduced load at the contact point.

For these reasons, bearing life varies according to the contact angle under the same load conditions.

Fig. 1.1



1. Life

Table 1.1 Value of Factors X and Y for Calculation of Equivalent Load $P = XF_r + YF_a$

Bearing type		$\frac{if_oF_a}{C_{or}}$	e	Single row (i=1) / DT (i=1) / DTD (i=1) / DTT (i=1)				DB (i=2) / DF (i=2) / DBB (i=2) / DFF (i=2)			
				$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
				X	Y	X	Y	X	Y	X	Y
Angular contact ball bearings ($C=C_r$)	15°	0.178	0.38	1	0	0.44	1.47	1	1.65	0.72	2.39
		0.357	0.40				1.40		1.57		2.28
		0.714	0.43				1.30		1.46		2.11
		1.07	0.46				1.23		1.38		2.00
		1.43	0.47				1.19		1.34		1.93
		2.14	0.50				1.12		1.26		1.82
		3.57	0.55				1.02		1.14		1.66
		5.35	0.56				1.00		1.12		1.63
	18°	0.181	0.44	1	0	0.43	1.30	1	1.42	0.70	2.11
		0.363	0.46				1.25		1.37		2.03
		0.726	0.48				1.18		1.30		1.92
		1.09	0.50				1.14		1.25		1.85
		1.45	0.52				1.10		1.21		1.79
		2.18	0.54				1.05		1.15		1.70
		3.63	0.57				1.00		1.10		1.63
	25°	—	0.68	1	0	0.41	0.87	1	0.92	0.67	1.41
	30°	—	0.80	1	0	0.39	0.76	1	0.78	0.63	1.24
	40°	—	1.14	1	0	0.35	0.57	1	0.55	0.57	0.93
Angular contact thrust ball bearings ($C=C_a$)	30°	—	0.72	—	—	0.48	1	0.74	0.55	0.48	1
	40°	—	1.05	—	—	0.60	1	1.01	0.64	0.60	1
	55°	—	1.79	—	—	0.81	1	1.60	0.60	0.81	1
	60°	—	2.17	—	—	0.92	1	1.90	0.56	0.92	1
Tapered roller bearings (1)		—	1.5tan α	1	0	0.4	0.4cot α	1	0.45cot α	0.67	0.67cot α

Bearing type		e	DBBD / DFFD							
			Axial load supported by 3 rows				Axial load supported by 2 rows			
			$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$	
			X	Y	X	Y	X	Y	X	Y
Angular contact thrust ball bearings ($C=C_a$)	30°	0.72	0.84	0.64	0.48	1	0.63	0.64	0.48	1
	40°	1.05	1.15	0.60	0.60	1	0.87	0.60	0.60	1
	55°	1.79	1.82	0.56	0.81	1	1.37	0.56	0.81	1
	60°	2.17	2.15	0.55	0.92	1	1.62	0.55	0.92	1

DBD / DFD																					
Axial load supported by 2 rows					Axial load supported by 1 row				Axial load supported by 3 rows				Axial load supported by 1 row								
i	$F_a/F_r \leqq e$		$F_a/F_r > e$		i	$F_a/F_r \leqq e$		$F_a/F_r > e$		i	$F_a/F_r \leqq e$		$F_a/F_r > e$		i	$F_a/F_r \leqq e$		$F_a/F_r > e$			
	X	Y	X	Y		X	Y	X	Y		X	Y	X	Y		X	Y	X	Y		
$\frac{3}{2}$	1	0.87	0.59	1.97	3	1	3.07	0.95	3.19	$\frac{4}{3}$	1	0.59	0.54	1.81	4	1	4.35	1.17	3.90		
		0.83		1.86			2.91		3.02			0.56		1.71			4.12		3.70		
		0.77		1.73			2.71		2.82			0.52		1.60			3.84		3.45		
		0.73		1.65			2.58		2.68			0.50		1.52			3.65		3.28		
		0.70		1.58			2.48		2.57			0.48		1.46			3.51		3.15		
		0.66		1.49			2.33		2.42			0.45		1.37			3.30		2.96		
		0.61		1.37			2.14		2.22			0.41		1.26			3.02		2.71		
		0.56		1.27			1.98		2.06			0.40		1.22			2.94		2.64		
$\frac{3}{2}$	1	0.75	0.57	1.72	3	1	2.63	0.93	2.80	$\frac{4}{3}$	1	0.51	0.53	1.57	4	1	3.73	1.15	3.38		
		0.72		1.66			2.53		2.69			0.49		1.51			3.59		3.26		
		0.68		1.57			2.40		2.55			0.46		1.43			3.41		3.09		
		0.65		1.51			2.31		2.45			0.45		1.38			3.28		2.97		
		0.63		1.46			2.24		2.38			0.43		1.34			3.18		2.88		
		0.60		1.39			2.12		2.26			0.41		1.27			3.02		2.74		
		0.56		1.29			1.97		2.10			0.40		1.22			2.91		2.64		
—	1	0.48	0.54	1.16	—	1	1.71	0.89	1.88	—	1	0.33	0.50	1.08	—	1	2.45	1.08	2.33		
—	1	0.41	0.52	1.01	—	1	1.45	0.84	1.64	—	1	0.28	0.48	0.93	—	1	2.05	1.03	2.01		
—	1	0.29	0.46	0.76	—	1	1.02	0.76	1.23	—	1	0.20	0.42	0.71	—	1	1.46	0.92	1.54		
—	0.91	0.41	0.48	1	—	0.56	0.89	0.48	1	—	0.98	0.30	0.48	1	—	0.46	1.04	0.48	1		
—	1.24	0.39	0.60	1	—	0.76	0.84	0.60	1	—	1.35	0.29	0.60	1	—	0.62	0.98	0.60	1		
—	1.95	0.36	0.81	1	—	1.20	0.78	0.81	1	—	2.12	0.27	0.81	1	—	0.98	0.90	0.81	1		
—	2.32	0.35	0.92	1	—	1.43	0.76	0.92	1	—	2.52	0.26	0.92	1	—	1.17	0.88	0.92	1		
—										—											

DBTD / DFTD									DBTT / DFTT											
Axial load supported by 4 rows				Axial load supported by 1 row				Axial load supported by 5 rows				Axial load supported by 1 row								
$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$		$F_a/F_r \leqq e$		$F_a/F_r > e$						
X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y					
1.03	0.64	0.48	1	0.39	0.64	0.48	1	1.06	0.64	0.48	1	0.34	0.64	0.48	1					
1.41	0.60	0.60	1	0.53	0.60	0.60	1	1.45	0.60	0.60	1	0.47	0.60	0.60	1					
2.22	0.56	0.81	1	0.84	0.56	0.81	1	2.28	0.56	0.81	1	0.74	0.56	0.81	1					
2.63	0.55	0.92	1	1.00	0.55	0.92	1	2.71	0.55	0.92	1	0.88	0.55	0.92	1					

1. Life

New Life Theory

Introduction

The conventional life calculation formula based on the theories of G. Lundberg and A. Palmgren addresses only subsurface-originated flaking. This phenomenon occurs from cracks due to dynamic shear stress immediately below the rolling surface that progressively reach the surface in the form of flaking.

$$\ln\frac{1}{S} \propto \frac{\tau_o^c \cdot N^e \cdot V}{Z_o^h} \cdots (1)$$

In recent years, bearing technology has advanced considerably, particularly in the areas of dimensional accuracy and material cleanliness. In addition, progress has been made in bearing-related technology such as lubrication cleanliness and filtration. As a result, bearings can now have a longer rolling fatigue life in a cleaner environment than the life obtained by the traditional ISO life calculation formula.

MONTON's new life calculation formula theorizes that rolling fatigue life is the sum total of the combined effects of both subsurface-originated flaking and surface-originated flaking occurring simultaneously.

Composition of MONTON's New Life Calculation Formula

(1) Subsurface-originated flaking

Before examining subsurface-originated flaking, contact of the rolling elements with the raceway surface must have a sufficient and continuous, clean oil-film.

Fig. 1.2 plots the L_{10} life for each test condition regarding the maximum surface contact pressure (P_{max}) along the y-axis and the number of repeated stress cycles applied along the x-axis. In the figure, line L_{10} theoretical is obtained using the conventional life calculation formula. As maximum surface contact pressure decreases, the line representing actual life separates from the conventional line and moves towards longer life. This separation suggests the presence of a fatigue load limit P_u below which no rolling fatigue occurs. This is better illustrated in Fig. 1.3. The following equation introduces a fatigue limit for subsurface-originated flaking into the Lundberg-Palmgren theory:

$$\ln\frac{1}{S} \propto N^e \int_V \frac{(\tau-\tau_u)^c}{Z_o^h} dV \cdots (2)$$

Fig. 1.2 Life Test Results Under Clean Lubrication Conditions

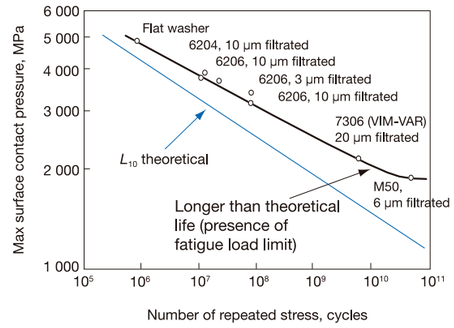
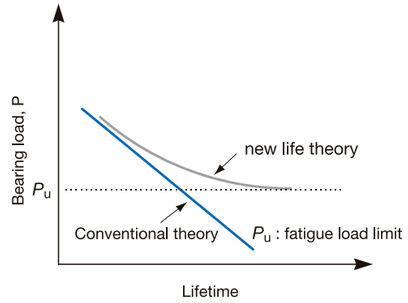


Fig. 1.3 New Life Theory That Considers Fatigue Limit



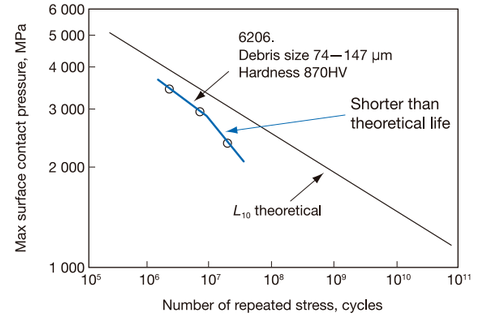
(2) Surface-originated flaking

Under actual bearing operation, the lubricant is often contaminated with foreign objects such as metal chips, burrs, casting sand, and so on. When foreign particles are mixed in the lubricant, the particles become pressed onto the raceways by the rolling elements, and dents occur on the surfaces of the raceways and rolling elements. Stress concentration occurs at the edges of the dents, generating fine cracks that over time propagate into flaking of the raceways and rolling elements. As shown in Fig. 1.4, the actual life is shorter than conventionally calculated life when lubrication is contaminated at low maximum surface pressure. The line representing actual life separates from the line created by theoretical life calculations and moves towards a shorter life. This shows that actual life under contaminated lubrication is further shortened because of the decrease in maximum surface contact pressure.

Table 1.2 Value of Contamination Coefficient a_c

	Very clean	Clean	Normal	Contaminated	Heavily contaminated
a_c factor	1	0.8	0.5	0.4–0.1	0.05
Application guide /Degree of filtration	<10 µm	10–30 µm	30–100 µm	Greater than 100 µm or no filtration (oil bath, circulating lubrication, etc.)	No filtration, presence of many fine particles
Application examples	Sealed, grease -lubricated bearings for electrical appliances, information technology equipment, etc.	Sealed, grease-lubricated bearings for electric motors Sealed, grease-lubricated bearings for railway axle boxes Bearings for machine tools, etc.	Normal usage Automotive hub unit bearings, etc.	Bearings for automotive transmission, industrial gearboxes; construction machines, etc.	–

Fig. 1.4 Life Test Results Under Contaminated Lubrication Conditions



MONTON's n ew life calculation formula accounts for trends in the results of the life test in a clean environment and at low load. Therefore, the new equation is a function of $(P\text{-}P_u)/C$. This function is affected by specific lubrication conditions identified by a lubrication parameter. In addition, it is assumed that the effects of different types and shapes of foreign particles are strongly influenced by the bearing load and lubrication conditions present and that such a relationship can be expressed as a function of the load parameter. This load parameter is defined in the new life calculation formula as $(P\text{-}P_u)/C \cdot 1/a_c$.

Based on the above concept, the calculation formula for surface-originated flaking is as follows:

$$\ln\frac{1}{S} \propto N^e \int_V \frac{(\tau-\tau_u)^c}{Z_o^h} dV \times \left\{\frac{1}{f(a_c, a_L)} - 1\right\} \cdots (3)$$

(3) Calculation of contamination coefficient a_c

Test results on ball and roller bearings with grease lubrication and clean filtration show that bearing life is a number of times longer than the conventionally calculated life. However, if a foreign particle is harder than HV350, hardness becomes a factor and a dent will appear on the raceway. Fatigue damage from these dents can progress to flaking in a short time. Test results on ball and roller bearings with foreign object contamination show that they have no more than 1/3 to 1/10 of the conventionally calculated bearing life.

Based on these test results, we have adopted contamination coefficient a_c as a basic concept for MONTON's new life theory. The contamination coefficient a_c is classified into five stages, as shown in Table 1.2.

1. Life

(4) New Life Calculation Formula L_{able}

Adding the formulas for subsurface-originated flaking (2) and surface-originated flaking (3) yields a formula that can be expressed as:

$$\ln\frac{1}{S} \propto N^{e}\int_{V}\frac{(\tau-\tau_u)^{c}}{Z_o^{h}}dV \times \left\{\frac{1}{f(a_c, a_L)}\right\} \cdots(4)$$

From this equation (4), another equation (5) can be derived:

$$L_{able} = a_1 \cdot a \cdot L_{10} \cdots(5)$$

Reliability factor a_1 is shown in Table 1.3. The theory also utilizes viscosity ratio κ($\kappa = \nu/\nu_1$ where ν is the operational viscosity and ν_1 is the required viscosity). The lubrication parameter a_L is a function of κ. The theory indicates that the better the lubrication conditions (the higher the κ value), the longer the life.

As shown in equation (6), correction factor a is a function of lubrication parameter a_L and load parameter $(P\text{-}P_u)/C \cdot 1/a_c$.

$$a \propto F\left\{\frac{P\text{-}P_u}{C}\cdot\frac{1}{a_c}, a_L\right\} \cdots(6)$$

Figures 1.5 and 1.6 chart the correction factor a of the new life calculation formula as a function.

Based on test results, the new life calculation formula considers ball bearings and roller bearings separately.

Table 1.3 Reliability Factor a_1

Reliability (%)	90	95	96	97	98	99
Reliability Factor	1.00	0.62	0.53	0.44	0.33	0.21

List of symbols used:

- S : Probability that flaking does not occur after stress has been repeated N times
- N : Number of repeated stresses
- τ : Internal stress
- τ_u : Internal stress at fatigue limit
- V : Stress volume
- Z_0 : Depth at which maximum shear stress occurs
- a_c : Contamination coefficient
- a_L : Lubrication parameter (a function of viscosity ratio K)
- P : Load applied to bearing
- P_u : Fatigue load limit
- C : Basic dynamic load rating
- e, c, h : Constants

Fig. 1.5 New Life Calculation Graph for Ball Bearings

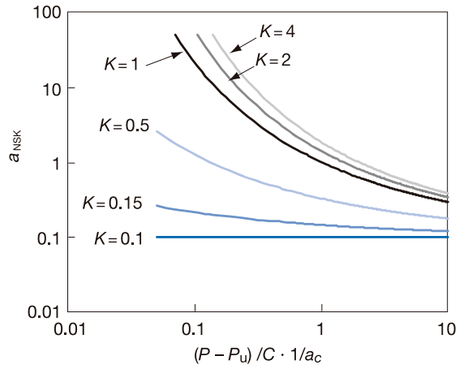
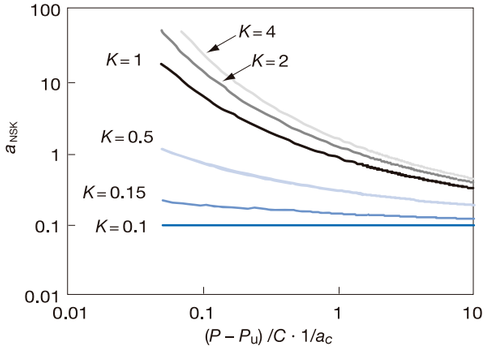


Fig. 1.6 New Life Calculation Graph for Roller Bearings



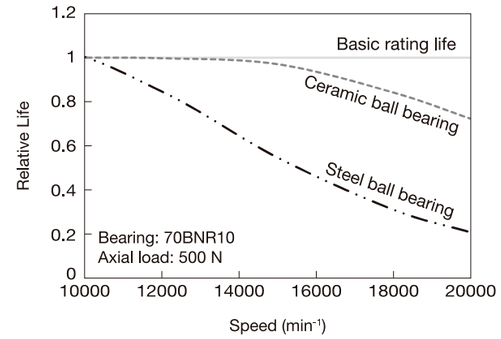
Life of High-Speed Bearings

When bearings are operated at high speed, the effect of centrifugal force acting on the rolling elements must be considered (Fig. 1.7). In the basic rating life equation on page 190, a ratio of basic dynamic load rating and external load was used, and the internal load generated by centrifugal force was not taken into account.

To perform convergence calculations that obtain a balance of the forces acting on rolling elements , including centrifugal force and various other elements.

An example result of such a calculation regarding bearing life in high-speed operation is given in Fig. 1.8.

Fig. 1.8 Example Calculated Life Considering Centrifugal Force



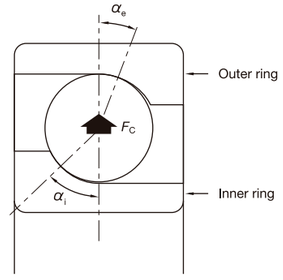
Note: Bearing life as mentioned above indicates rolling fatigue life, which does not include bearing failure caused by seizure, wear, or the like. It is difficult to calculate how long a bearing will perform until a bearing failure takes place. Please refer to page 190 for details on the definition of bearing life.

Life of Ceramic Hybrid Bearings

As ceramic balls have a lower density than steel balls, the increase in internal load due to centrifugal force in high-speed operation is less than with steel balls. Thus, the life calculation will show a longer life.

ISO 281 does not define static load ratings and dynamic load ratings for bearings with ceramic balls. Therefore, the load rating values listed in the bearing tables from page 48 onward are reference values calculated with the same formula that applies to steel ball bearings.

Fig. 1.7 Change in Contact Angle Due to Centrifugal Force



F_C : Centrifugal force acting on the rolling elements

Life Calculation for Multiple Bearings as a Group

When multiple rolling bearings are used in one machine, the fatigue life of individual bearings can be determined if the load acting on individual bearings is known. In general however, the machine becomes inoperative if a bearing in any part fails. It may therefore be necessary in certain cases to know the fatigue life of a group of bearings used in one machine.

The fatigue life of bearings varies greatly, and our fatigue life calculation equation $L_{10} = \left(\frac{C}{P}\right)^{p}$ $\left(\text{where p=3 for ball bearings and } p=\frac{10}{3} \text{ for roller bearings}\right)$ applies to the 90% life, or "basic rating life". This refers to either the number of revolutions or hours that 90% of bearings of the same type operated under the same conditions can reach.

In other words, the calculated fatigue life for one bearing has a probability of 90%. Since the endurance probability of a group of multiple bearings for a certain period is a product of the endurance probability of individual bearings for the same period, the basic rating life of a group of multiple bearings is not determined solely from the shortest basic rating life among the individual bearings. In fact, the group life is much shorter than the life of the bearing with the shortest fatigue life.

Defining the basic rating life of individual bearings as L_1, L_2, L_3 ... and the basic rating life of the entire group of bearings as L, the relationship may be expressed by the following equation:

$$L = \frac{1}{\left(\frac{1}{L_1^{1.1}} + \frac{1}{L_2^{1.1}} + \frac{1}{L_3^{1.1}} + \cdots\right)^{\frac{1}{1.1}}}$$

2. Static Load Ratings and Static Equivalent Loads

Basic Static Load Rating

When subjected to an excessive load or a strong shock load, rolling bearings may incur a local, permanent deformation of the rolling elements and raceway surface. This deformation increases in area and depth as the load increases, and when the load exceeds a certain limit, the smooth running of the bearing is impeded.

The basic static load rating produces the following calculated contact stress at the center of the contact area between the raceway surface and the rolling element subjected to the maximum stress:

for ball bearings : 4 200MPa
for roller bearings : 4 000MPa

In this most heavily contacted area, the sum of the permanent deformation of the rolling element and that of the raceway is approximately 0.0001 times the rolling element's diameter. The basic static load rating value C_0 is listed in the bearing tables as C_{0r} for radial bearings and C_{0a} for thrust bearings.

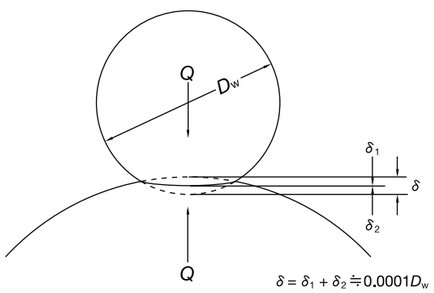
The basic static load rating of multi-row bearing arrangements may be calculated using the following formula:

$$C_j = j \times C_1$$

where j : Number of rows
C_1 : Basic static load rating for a single-row bearing
C_j : Basic static load rating for a multi-row bearing (where j refers to the number of rows)

However, when calculating the basic static load rating for thrust bearings C_{0a}, j refers only to the number of rows that sustain an axial load.

Fig. 2.1 The Relation between Indentations and Basic Static Load Rating



Static Equivalent Load

The static equivalent load is a hypothetical load that produces a contact stress equal to the maximum contact stress the bearing is subjected to under actual load conditions while stationary in the area of contact between the most heavily stressed rolling element and the bearing raceway.

For radial bearings, the radial load passing through the bearing center is used as the static equivalent load. For thrust bearings, the axial load in the direction coinciding with the central axis is used as the static equivalent load.

(a) Static equivalent loads for radial bearings

The greater of the two values calculated from the following equations should be adopted as the static equivalent load on radial bearings:

$$P_0 = X_0 F_r + Y_0 F_a \quad \cdots\cdots(1)$$

$$P_0 = F_r \quad \cdots\cdots(2)$$

where P_0 : Static equivalent load (N)
F_r : Radial load (N)
F_a : Axial load (N)
X_0 : Static radial load factor
Y_0 : Static axial load factor

(b) Static equivalent loads for thrust bearings

$$P_0 = X_0 F_r + F_a \quad \alpha \neq 90° \quad \cdots\cdots(3)$$

where P_0 : Static equivalent load (N)
α : Nominal contact angle

Note that the accuracy of this equation decreases when $F_a < X_0 F_r$.

The values X_0 and Y_0 of equations (1) and (3) are shown in Table 2.1.

Note that $P_0 = F_a$ for thrust bearings with $\alpha = 90°$.

Table 2.1 Static Equivalent Loads

Bearing type		Single row		Double row	
		X_0	Y_0	X_0	Y_0
Angular contact ball bearings	$\alpha=15°$	0.5	0.46	1	0.92
	$\alpha=18°$	0.5	0.46	1	0.92
	$\alpha=25°$	0.5	0.38	1	0.76
	$\alpha=30°$	0.5	0.33	1	0.66
Tapered roller bearings	$\alpha\neq0$	0.5	0.22cot α	1	0.44cot α
Cylindrical roller bearings	$\alpha=0$	$P_0 = F_r$			
Thrust ball bearings	$\alpha=90°$	$P_{0a} = F_a$			
Thrust roller bearings	$\alpha=90°$				
Thrust ball bearings	$\alpha\neq90°$	$P_{0a} = F_a + 2.3F_r \tan\alpha$			
Thrust roller bearings	$\alpha\neq90°$	(where $F_a > 2.3 F_r \tan\alpha$)			

Permissible Static Load Factor

The permissible static equivalent load on bearings varies depending on their basic static load rating, their application, and operating conditions. The permissible static load factor f_S is a safety factor that is applied to the basic static load rating, and it is defined by the ratio in the equation below:

$$f_S = (C_0/P_0)$$

where C_0 : Basic static load rating
P_0 : Static equivalent load

Table 2.2 lists the generally recommended values for the permissible static load factor f_S.

Table 2.2 Values of Permissible Static Load Factor f_s

Operating conditions	Lower limit of f_s	
	Ball bearings	Roller bearings
Low-noise applications	2.0	3.0
Bearings subjected to vibration and shock loads	1.5	2.0
Standard operating conditions	1.0	1.5

Permissible Axial Load for Angular Contact Ball Bearings

We have defined the limiting static axial load as the smaller of the two values listed below:

1. Limiting axial load that produces shoulder override
   The limiting load at which the contact ellipse generated between the ball and the raceway overrides the shoulder of the raceway groove (Fig. 2.2)

2. Limiting axial load in terms of surface pressure
   The limiting load at which the contact stress at the center of the contact area between the ball and the raceway groove reaches a level that leaves an indentation as defined in the basic static load rating (Fig. 2.3)

To maintain optimal bearing performance , MONTON defined permissible static axial load values by applying a safety factor to the limiting axial load based on many years of experience.

The formula for calculating the basic static axial load rating C_{0a} does not take the shoulder height of the raceway groove into account. Therefore, in some cases the C_{0a} value may exceed the limiting axial load that produces shoulder override. In such cases, the maximum load that the bearing can sustain is lower than the C_{0a} value, making the C_{0a} value unsuitable (Fig. 2.4). Therefore, instead of C_{0a} values, we have listed limiting axial load values in the bearing tables where necessary, particularly for angular contact thrust ball bearings as they are usually used to support heavy axial loads.

Fig. 2.2 Limiting Axial Load that Produces Shoulder Override

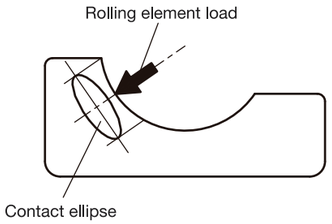


Fig. 2.3 Limiting Axial Load in Terms of Surface Pressure

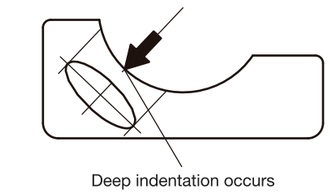
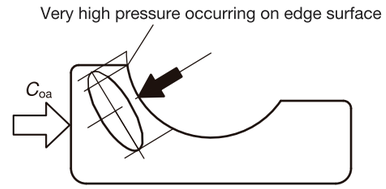


Fig. 2.4 C_{0a} and Limiting Axial Load



3. Angular Contact Ball Bearing Combinations

Angular Contact Ball Bearing Combinations

The combinations of angular contact ball bearings used for the fixed end of spindles are usually 2 row (DB), 3 row (DBD), and 4 row (DBB) sets. However, in 3 row combinations the preload is unevenly distributed between the bearings, resulting in a very limited optimum range of preload which makes them unsuitable for high-speed applications.

Matched bearings are manufactured as sets, so when they are mounted adjacent to each other, the specified preload is automatically achieved. The variation of bore and outer diameter within each set of matched bearings is adjusted to less than 1/3 of the permissible tolerance.

Table 3.1 Features of Each Combination

◎Excellent ◎Very good ○Good △Fair →One direction only ⇔Two directions

	DB	DF	DT	DBD	DBB
Load direction	⇔	⇔	→	⇔	⇔
Moment stiffness	◎	○	△	◎	◎
Speed capability	◎	◎	◎	△	○
Low heat generation	◎	◎	◎	△	○
Stiffness	○	○	△	◎	◎

Features of Each Combination

● Back-to-back Arrangement, DB

Axial loads in both directions and radial loads can be sustained. Since the distance between the effective load centers is large, this type is suitable if moments are applied. However, in case of insufficient housing accuracy or shaft misalignment, internal load of the bearings could be large enough to possibly cause premature failure due to the high level of moment stiffness.

● Face-to-face Arrangement, DF

Compared with the DB type, the distance between the effective load centers is small, so the capacity to sustain moments is inferior to the DB type. On the other hand, this type is suitable for use with housings that have less accuracy or larger shaft deflections due to low bending stiffness of the shaft.

● Tandem Arrangement, DT

Axial loads in one direction and combined loads can be sustained. Since axial stiffness of this type is twice the value of a single row type, this arrangement is used when the axial load in one direction is heavy.

If preload is required, it needs to be applied externally, e.g. by using a spring.

● 3 Row Arrangement, DBD

Axial loads in both directions and radial loads can be sustained. However, the preload distribution to each bearing is not equal, and preload on the counter side (single side) is twice that of the other side. Consequently, this type is unsuitable for high-speed operation because of the large increase of internal load on the single side, which could lead to bearing failure.

● 4 Row Arrangement, DBB

Axial loads in both directions and radial loads can be sustained. In situations that have the same axial clearance as DB arrangement, preload and stiffness are twice that of the DB arrangement. Also, the permissible axial load of a 4 row arrangement is larger than that of a DB arrangement.

Fig. 3.1 The Distance between the Effective Load Centers of Back-to-back and Face-to-face Arrangements

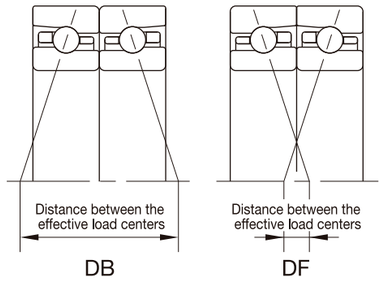


Fig. 3.2 Load Application Direction in Back-to-Back and Tandem Arrangements

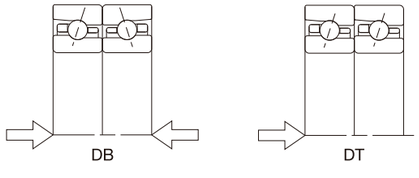
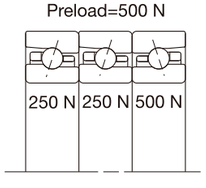


Fig. 3.3 Internal Preload in DBD Arrangement



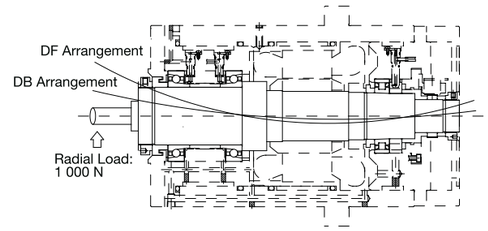
Shaft Bending Comparison between Back-to-back and Face-to-face Arrangements

Moment stiffness is different between back-to-back and face-to-face arrangements. We have calculated typical shaft deflections for the spindle structure shown in Fig. 3.4. In this example, angular contact ball bearings (75BNR10XET) are used at the front end and shaft deflections are shown for both DB and DF configurations. A radial load of 1 000 N applied to the spindle nose will cause the following radial deflection of the spindle nose:

$$\sigma_{DB} = 2.4079 \times 10^{-2} \text{ (mm)}$$
$$\sigma_{DF} = 2.9853 \times 10^{-2} \text{ (mm)}$$

This demonstrates the effect the distance between effective load centers has on spindle bending.

Fig. 3.4 Spindle Deflection Curve



Mounting Instructions for Matched Angular Contact Ball Bearings

Direction of Matching

For matched bearings, the mounting order and load application direction are very important. As shown in Fig. 3.6, marks on the outer ring surfaces of the bearings form a “V” when the bearings are properly matched and aligned.

Radial Run-out Mark

On the side surface or chamfered part of the inner rings, the symbol “○” is marked to indicate the position of maximum radial run-out. Optimum accuracy is achieved when the bearing is mounted so the “○” symbol is placed directly opposite the point of maximum shaft eccentricity.

Fig. 3.5 The Symbol for the Position of Maximum Radial Runout of the Inner Ring

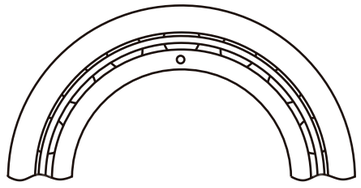
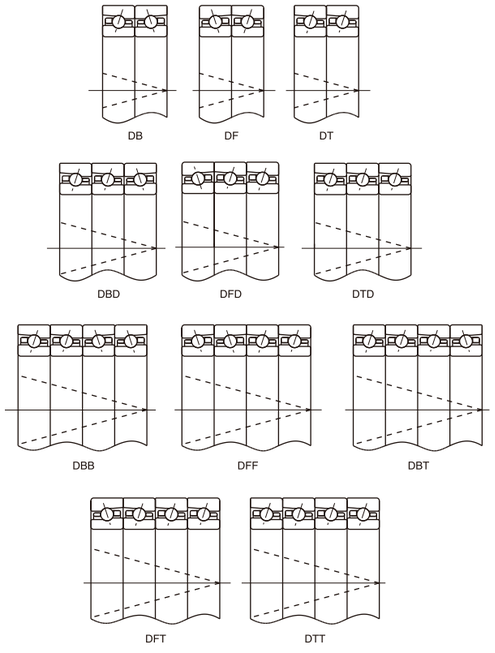


Fig. 3.6 Combinations of Angular Contact Ball Bearings



3. Angular Contact Ball Bearing Combinations

Important Points to Consider When Using Matched Bearings

The axial clearance (stand-out) of each bearing in a set of matched bearings (DB, DT, DFD etc.) has been adjusted and controlled, so that the specified amount for each standard preload is achieved when the bearings are arranged in the order indicated by the marks on the surface of their outer rings. These marks form a “V” when the bearings have been correctly mounted. Thus, as long as the bearing direction and the order of the bearings are not altered, bearing axial clearance or preload gap is controlled even if some bearings are selected from a bearing set. In this case the marks on the outer rings will also form continuous straight lines.

Should the direction or order of matched bearings be changed, the clearance adjustment of mating surfaces will be lost and the resulting clearance values will be unknown. If used this way, problems may arise due to excessive or insufficient preload and uneven load distribution. Therefore, in order to use matched bearings in other than the prescribed directions and order, it is necessary to measure the stand-out (offset) of each individual bearing and use spacers to adjust the axial clearance according to these measurements.

We do not recommend machining the bearings themselves to the desired offset, as debris from grinding may remain inside the bearing.

To customers who wish to use the same bearings on various machines, we recommend stocking universal combination bearings rather than sets of matched bearings prepared for specific arrangements. Universal combination bearings are ready for use in different arrangements.

Fig. 3.7 DT Combination

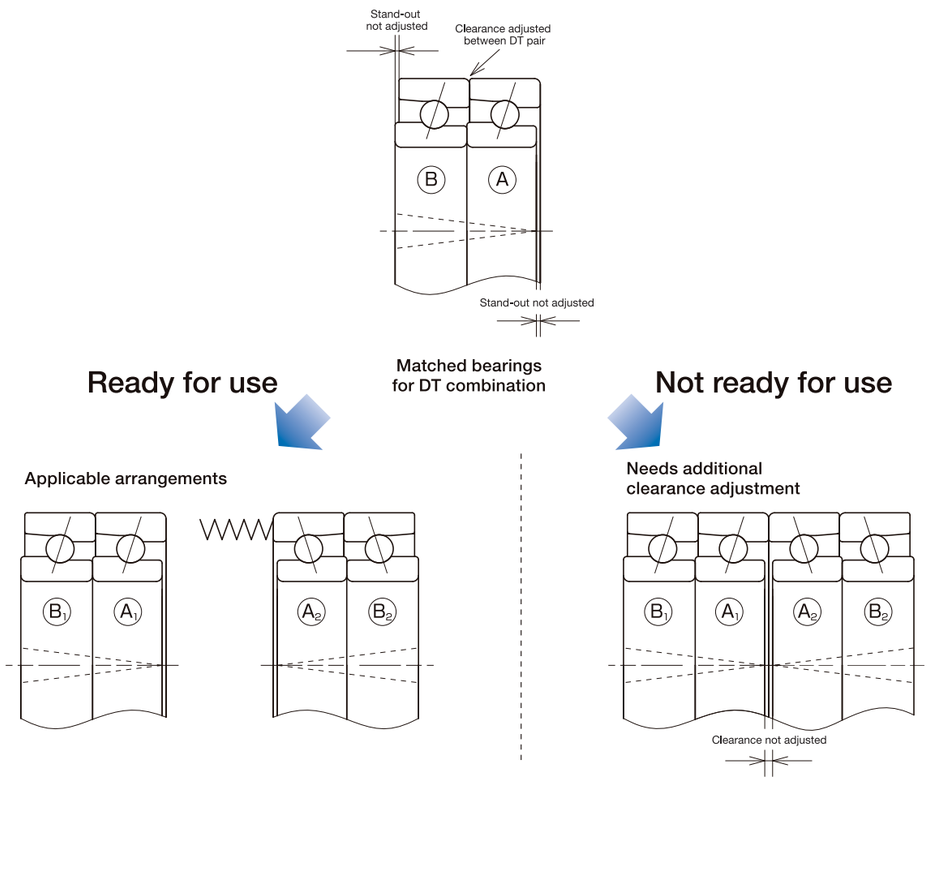
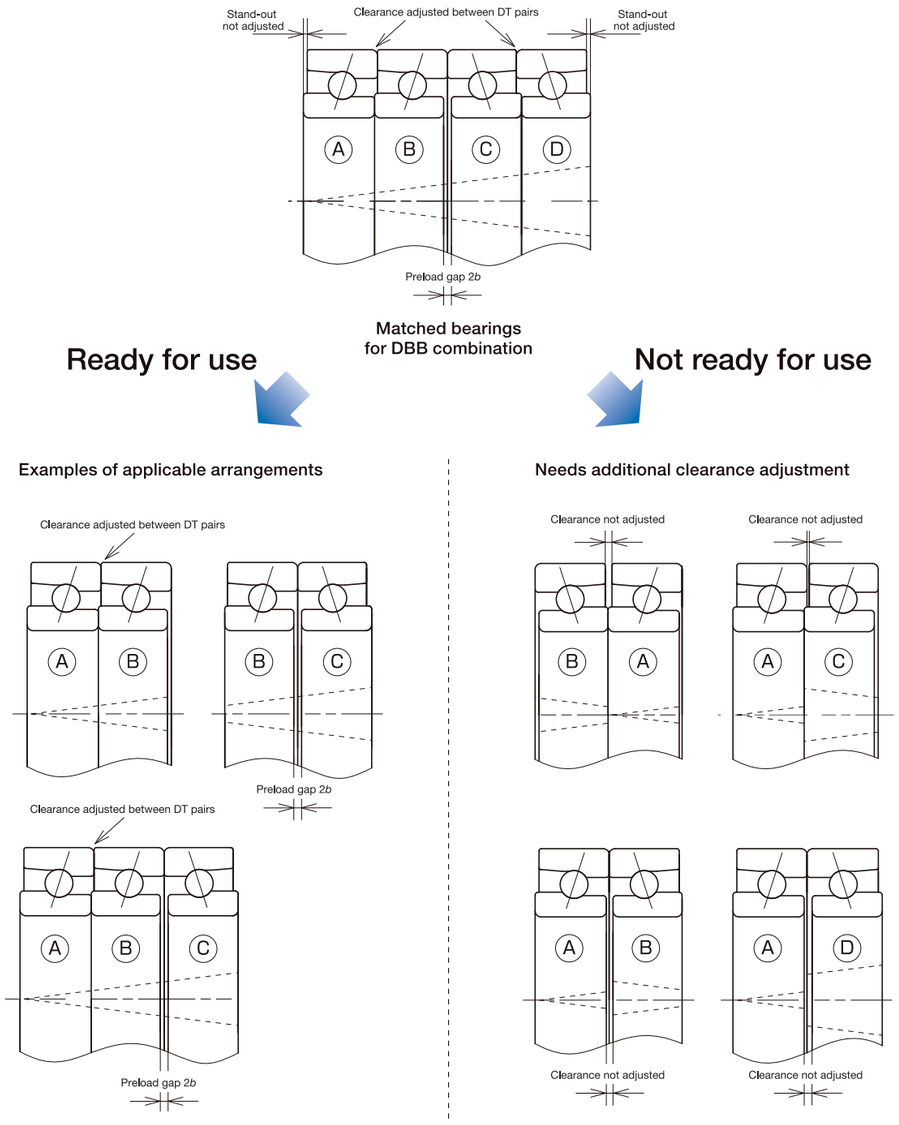


Fig. 3.8 DBB Combination

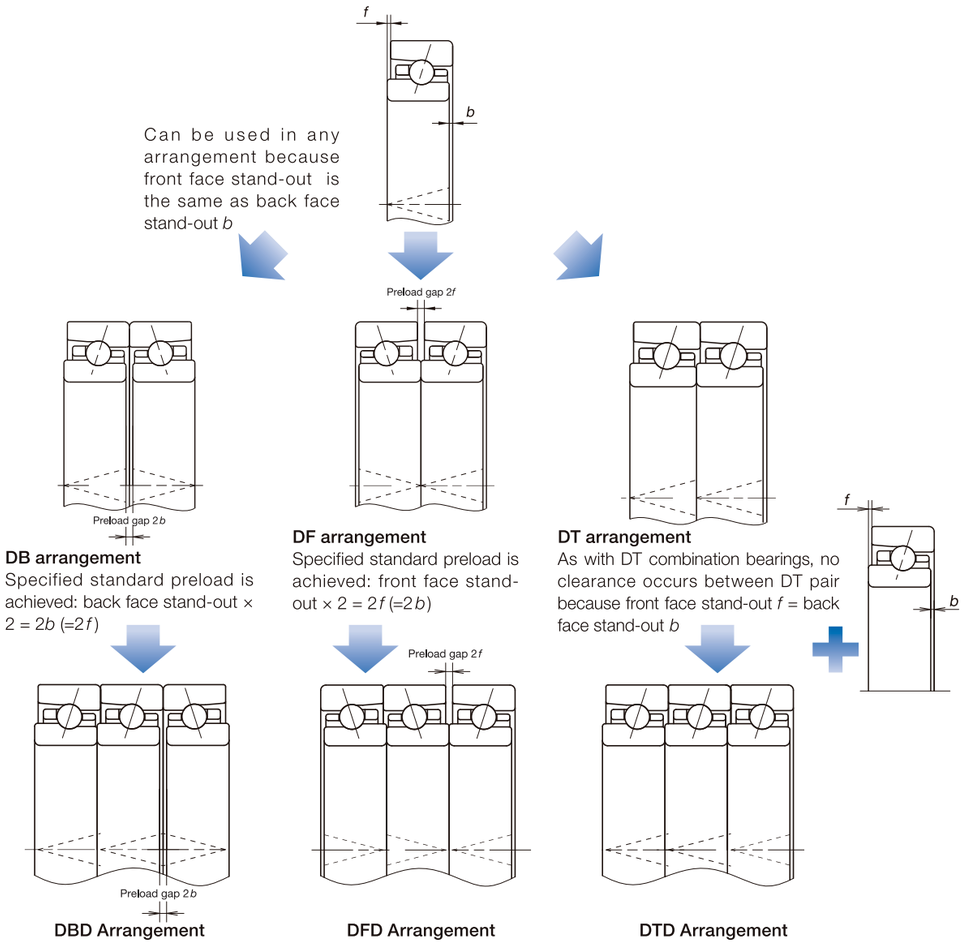


3. Angular Contact Ball Bearing Combinations

Universal Combination Bearings

MONTON manufactures universal combination bearings which have been controlled to have the same amount of stand-out (offset) on their front and back faces. That way, for bearings with the same bearing number, users will achieve the specified amount for each standard preload, regardless of which combination they chose. Each universal combination bearing comes with a V-shaped mark on the surface of the outer ring to simplify identification of the correct direction when mounting and to ensure that the correct combination is achieved. The V-shaped mark points to the direction of the axial load that the inner ring supports (contact angle).

Fig. 3.9 Universal Combination



Types of Universal Combination Bearings

MONTON supplies four types of universal combination bearings, as shown in Table 3.2. Variation of bore and outer diameter are controlled for multiple-row universal combination bearings.

Table 3.2 Types of Universal Combination Bearings and Their Features

	SU	DU	DUD	QU
Number of rows	1	2	3	4
Variation of bore and outer diameter	—	Controlled to be within 1/3 of tolerance		

Note: Variation control for P4Y class bearings is the same as for P4 class bearings.

Notice for the Use of Single Universal (SU) Bearings

- In the case of bearing sets (DB, DU etc.), the variations of bore and outer diameter within each set are controlled. However, when using single row universal combination bearings (SU), users should check the actual bore/outer diameter variation printed on the box of each bearing and make sure variation of these dimensions is low. Otherwise variations in housing or shaft fit may occur that result in imbalances of internal load, which may cause damage to the bearings.
- One way of keeping the variation of bore and outer diameter of SU bearings low is to choose the P4Y accuracy class that MONTON provides. P4Y rated bearings have a running accuracy of ISO Class 4. As bore diameter and outer diameter are strictly controlled, these bearings are suitable for random matching.

Fig. 3.10 Tolerances of P4 and P4Y Accuracy

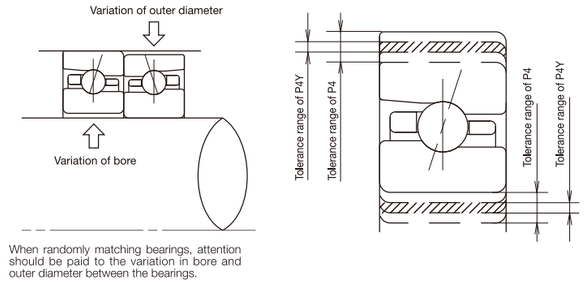
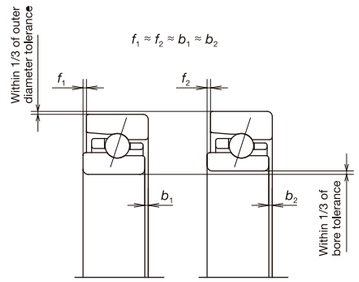
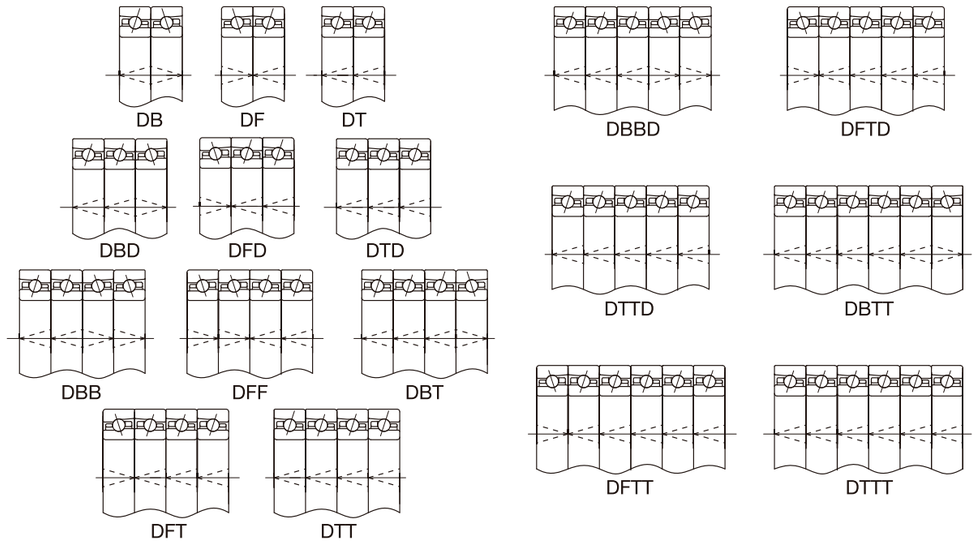


Fig. 3.11 DU Combination



Combination Mark and Matching Method for Universal Combination Bearings

Fig. 3.12 Arrangements of Universal Combination Bearings



4. Preload and Rigidity

Regarding the rigidity of machine tool spindles, it is possible to think of the bearings as being springs. When an axial load is applied to the spindle, axial displacement of the spindle is determined by the axial rigidity of the fixed end bearings.

Radial loads applied to the spindle end will cause radial deflection. While shaft deformation will account for most of this deflection, bearing deflection is also a factor that may not be ignored.

When high radial rigidity is required, cylindrical roller bearings are generally used. In this case, axial loads are usually sustained by angular contact thrust ball bearings. The bigger the contact angle of an angular contact ball bearing, the higher its axial rigidity.

Normally, preload is applied to bearings in order to increase the rigidity of machine tool spindles. However, excessively high preload may cause seizure and flaking. Many users increase rigidity by using a combination of two or more angular contact ball bearings. This is especially true for ball screw support bearings, where high rigidity is required, contact angle is as large as possible, and preload is higher than that for a spindle.

Purpose

The main purposes of applying preload to bearings in machine tool spindles are as follows:

- To improve the running accuracy of the spindle.
- To increase spindle rigidity.
- To minimize noise due to spindle vibration.
- To prevent abnormal wear due to oscillation and vibration
- To prevent sliding between the rolling elements and raceways

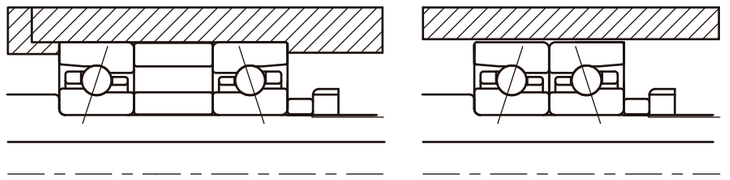
Usually a preload is applied to bearings by using two or more bearings in combination, such as angular contact ball bearings or tapered roller bearings. Cylindrical roller bearings can be preloaded by making the radial internal clearance negative.

(1) Position Preload

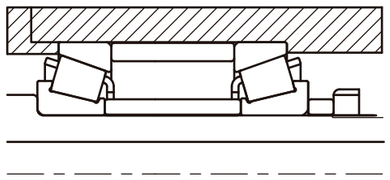
A position preload is achieved by fixing two axially opposed bearings so that their position relative to one another remains unchanged during operation. In practice, the following three methods are generally used to obtain a position preload.

1. By using a spacer or shim of proper size to obtain the required spacing and preload, as shown in Fig. 4.1(a) on the left, (b) and (c).
2. By installing a bearing set with previously adjusted stand-out dimensions and axial clearance, as shown in Fig. 4.1(a) on the right.
3. By utilizing bolts or nuts to allow adjustment of axial preload, as shown in Fig. 4.1(d). In this case, starting torque should be measured to verify proper preload. However, this method cannot be recommended for high precision machine tool spindles due to difficulty in verifying the proper preload, thus risking vertical displacement (tilting) of the bearing.

Fig 4.1 Position Preload Examples

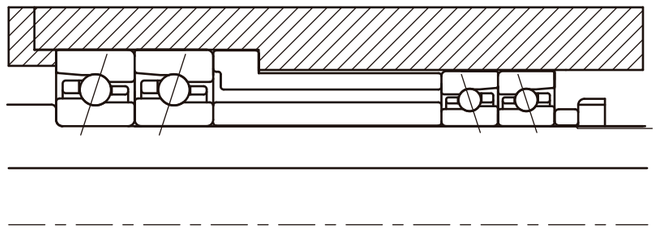


(a) Angular contact ball bearings in position preload

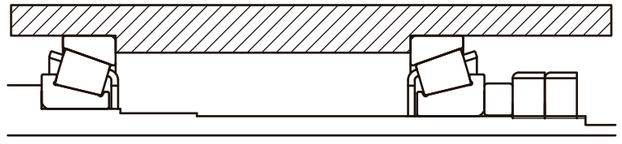


Note: The cages of tapered roller bearings usually protrude from the bearing's end faces. Customers who wish to reduce bearing span, please bear in mind the required minimum amount of spacer width.

(b) Tapered roller bearings in position preload



(c) Bearing combinations of differently sized bearings in position preload



(d) Position preload without spacers

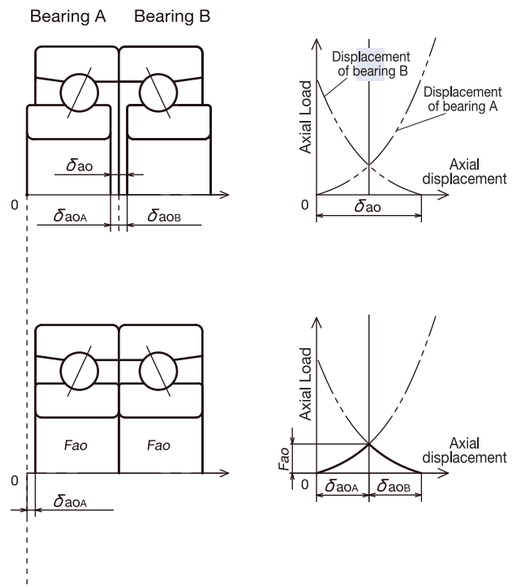
4. Preload and Rigidity

Axial Load and Displacement in Position Preload (DB Arrangement)

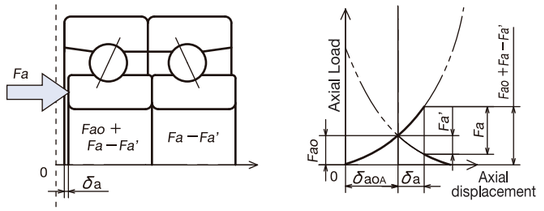
Fig 4.2 illustrates the mechanism of preload and axial load in bearing combinations.

Fig 4.2 Axial Displacement in Position Preload (DB Arrangement)

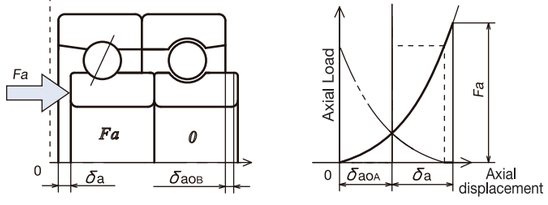
(1) When the inner rings are fixed axially, bearings A and B are displaced by δ_{a0A} and δ_{a0B}, respectively. Thus, the axial clearance (preload gap) δ_{a0} between the inner rings is eliminated. In this condition, preload F_{a0} is imposed on each bearing.



(2) When an axial load F_a is applied to the preloaded bearing combination as shown, the inner ring of bearing A will be displaced by δ_a. A balance between the loads acting on each bearing will be achieved in the point where the amount of displacement of bearing A equals that of bearing B.



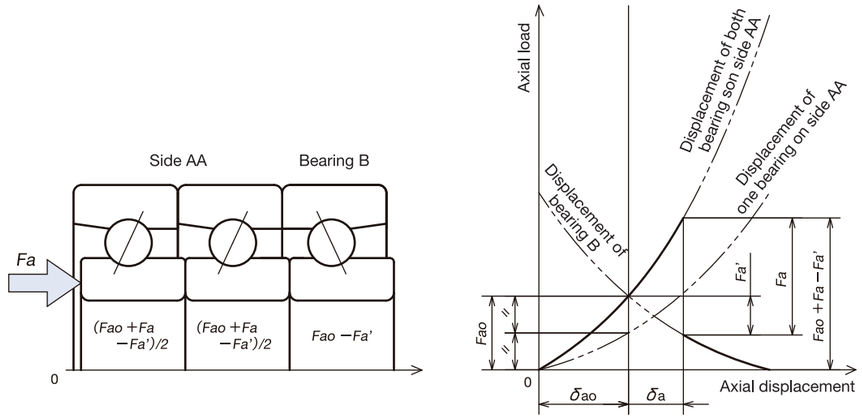
(3) When a large axial load is applied so that the displacement of the inner ring of bearing B exceeds δ_{a0B}, bearing B will no longer sustain axial load. Axial load will be sustained by bearing A only. Therefore axial rigidity will decrease.



Axial Load and Displacement in Position Preload (DBD Arrangement)

In DBD arrangements, one direction of axial load is divided equally between two bearings. Apart from that the basic concept is the same as with DB arrangements (shown in Fig 4.2.)

Fig 4.3 Axial Displacement in Position Preload (DBD Arrangement)

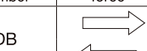
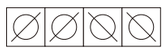
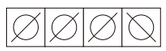


Unloading Force

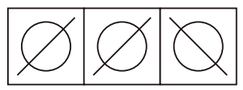
As shown in Fig 4.2 (3), when a large axial load is applied to preloaded bearings, the bearing opposite the side that experiences the thrust will be relieved of axial load. In such cases, sliding may occur between the rolling elements and the raceways. In high-speed rotation, this may lead to excessive wear or bearing damage.

Where bearings of the same type are used in combinations, the level of load that will cancel preload can be approximated as 3 times the preload of a single bearing in the case of angular contact ball bearings, and 2 times the preload of a single bearing for tapered roller bearings. Fig. 4.4 shows the factors for combinations of angular contact ball bearings and an example of a calculation of unloading force.

Table 4.1 Approximate Values of Unloading Forces

Combination	Combination symbol	Direction of force	Unloading force factor (multiply with single row preload value)
	DB		3 3
	DBD		6 2.1
	DBB		6 6
	DBT		9 1.8
	DBBD		9 2.3

Calculation Example



Direction of force	Unloading force
	500×6=3 000N
	1 000×2.1=2 100N

4. Preload and Rigidity

Standard Clearance

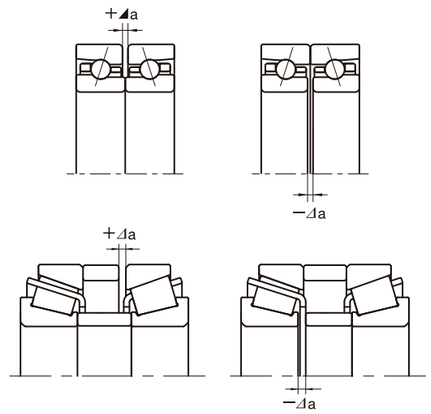
MONTON supplies matched angular contact ball bearings in four standard preload classes:

EL: Extra light preload L: Light preload
M: Medium preload H: Heavy preload

In addition, two special clearances are available for matched angular contact ball bearings and for tapered roller bearings:

CA: Axial clearance ··· (positive clearance in the axial direction)
CP: Preload gap ····· (preload is generated)

Fig 4.4 Special Clearances



CA: Axial clearance CP: Preload gap

Preload Adjustment with Spacers

The measured axial clearance of each bearing is listed in the bearing tables in Part 4 of this catalogue. The listed values refer to DB and DF arrangements and do not include the influence of shaft and housing fit or nut clamping force.

When using spacers to adjust the preload (for example L→ EL, L→ M etc.), adjust the difference between measured axial clearance and target clearance value with a spacer. With DB arrangement, reduce the width of the inner-ring spacer to increase preload, and reduce the width of the outer-ring spacer to decrease preload.

In the case of universal combination bearings, the following applies:

When using a DB combination, the amount of axial clearance between the bearings equals the sum of the back face stand-out values of each bearing.

In a DF combination, the amount of axial clearance between the bearings equals the sum of the front face stand-out values.

Please adjust the difference to your required axial clearance with spacers. Table 4.2 shows measuring loads for measuring axial clearance. The values in the table indicate the amount of load necessary to obtain stable measurements.

Fig 4.5 Adjustment of Axial Clearance with Spacers

Example of adjustment by spacers:
100BER10ETDBELP4, change preload from EL → L
EL: 0
L: -12
Inner-ring spacer should be 12㎛ less in width than outer-ring spacer.

Table 4.2 Measuring Loads for Axial Clearance Measurement

Nominal bearing outer diameter D (mm)		Measuring load (N)
Larger than	Up to	
10 (1)	50	24.5
50	120	49
120	200	98
200	400	196

(1) Outer diameter of 10mm is included in this range

Measuring Axial Clearance of Angular Contact Ball Bearing Combinations

In the case of a DB arrangement, place the bearing without the inner-ring spacer on the cradle as described in the figure below; then apply the measuring load to the inner ring. After the bearing is sufficiently stabilized, set the dial gauge to zero.

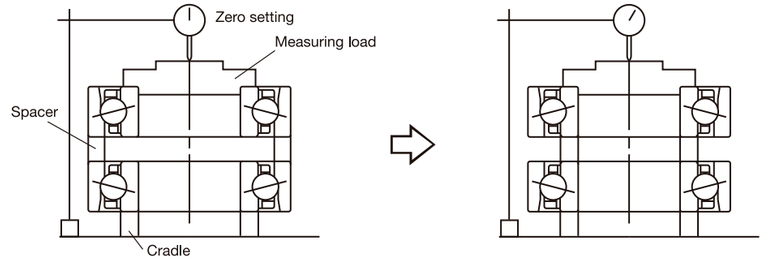
Next, after removing the outer-ring spacer, place the bearing with the inner-ring spacer on the cradle and apply measuring load in the same way as described above. The reading on the dial gauge now indicates the axial clearance. A positive reading signifies a CA clearance (positive clearance in axial direction). A negative reading signifies a CP clearance, which generates preload.

The axial clearance of a DF arrangement is measured in the same manner as with a DB arrangement, although the positions of spacers and cradles are different.

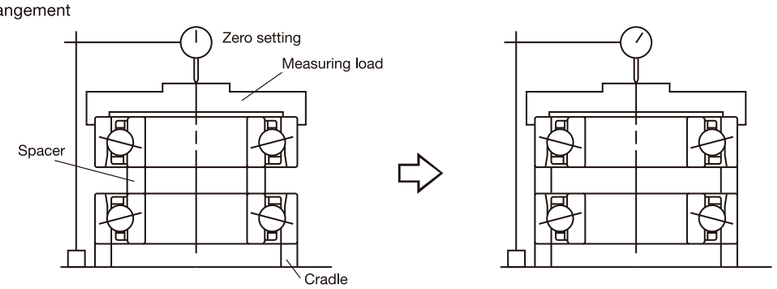
With a DT arrangement, the sum of front face stand-out and back face stand-out of the combined bearings at the mating surfaces should be zero.

For single-row bearings, axial clearance of a double-row arrangement can be obtained by adding the measured values of each bearing.

DB Arrangement

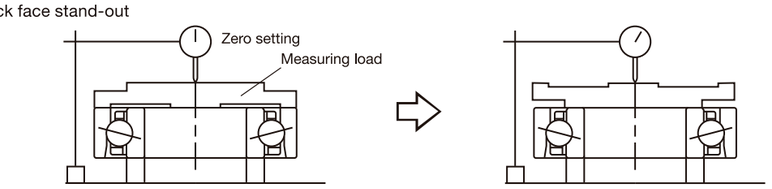


DF Arrangement

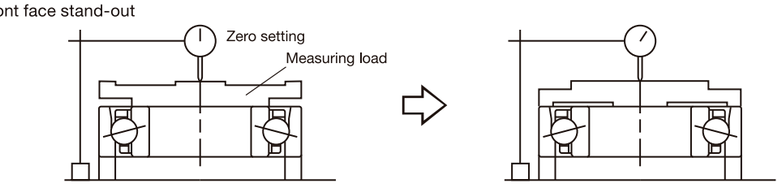


Single Row

Back face stand-out



Front face stand-out



4. Preload and Rigidity

Measuring Axial Clearance of Tapered Roller Bearing Combinations (Stand-out Measuring Method)

In the case of a DB arrangement, place a single row bearing on a cradle with the back face of the inner ring facing down. Turn the outer ring (at least 10 turns) to stabilize the rollers. Then measure inner ring width and assembled bearing width. Next, measure the inner ring width and assembled bearing width of the second bearing in the same way. Finally, measure widths K and L of the spacers.

Inserting these measurements into the equation below will obtain axial clearance Δ_a.

$\Delta_a = (L\text{-}K)\text{-}(f_A + f_B) = (L\text{-}K)\text{-}[(T_A\text{-}B_A)+(T_B\text{-}B_B)]$

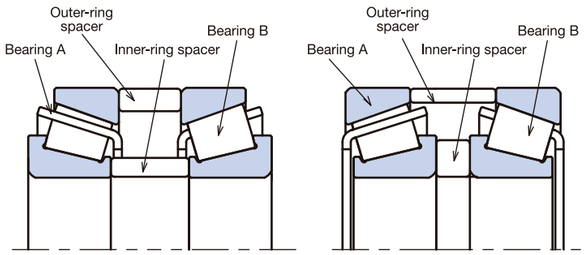
$\Delta_a < 0$ signifies a preload.

In the case of a DF arrangement, measure the outer ring instead of the inner ring. This gives the following equation for axial clearance:

$\Delta_a = (K\text{-}L)\text{-}(b_A + b_B) = (K\text{-}L)\text{-}[(T_A\text{-}C_A)+(T_B\text{-}C_B)]$

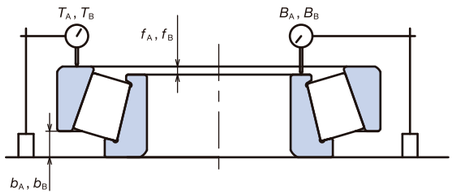
Tapered rolling bearings in DF arrangement are often operated without the use of an inner-ring spacer, so that the inner rings of both bearings touch directly. In this case, $L = 0$.

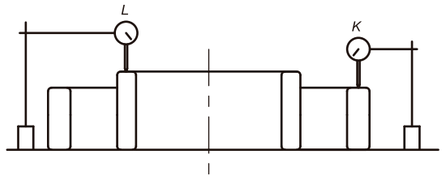
Since the cages protrude, please make sure you place the bearings with the correct side onto the cradle when measuring tapered roller bearings and take care to avoid mechanical interaction with other parts so as to prevent cage deformation.



DB Arrangement

DF Arrangement





f : Back face stand-out
b : Front face stand-out
T : Assembled bearing width
C : Outer ring width
B : Inner ring width
K : Outer-ring spacer width
L : Inner-ring spacer width

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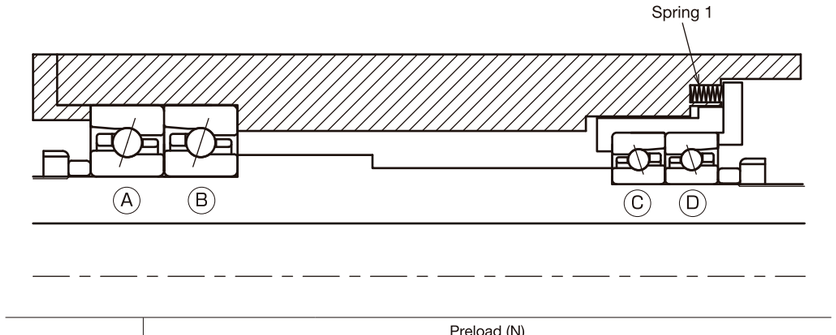
(2) Constant Pressure Preload

Constant pressure preload is achieved using a coil or disc spring. Even if the relative position of the bearings changes during operation, the magnitude of the preload remains relatively constant throughout all the various operation conditions. Therefore constant pressure preload is used for combinations of angular contact ball bearings in high-speed applications.

One example is shown in Fig. 4.6. Since spring rigidity is, as a rule, small compared with bearing rigidity, the change in spring preload due to bearing displacement is negligible. Thus, the preload applied to bearings C, D and E in the figure below will be approximately the same in both vertical shaft and horizontal shaft configurations.

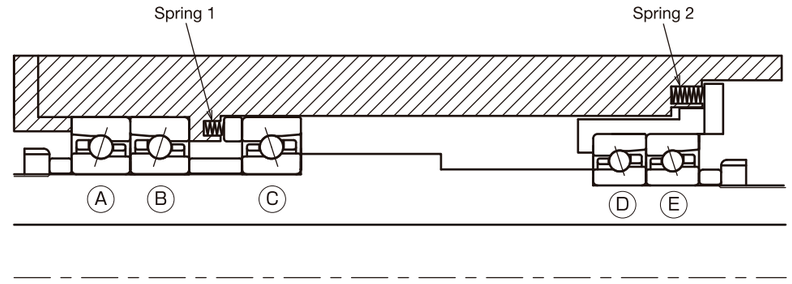
However, in addition to the forces of each spring, bearings A and B will also be affected by the dead weight of the shaft in vertical operation. Axial loads exerted from the free end towards the fixed end (from right to left in the figure below) will reduce preload of bearings A and B. It is necessary to consider these effects when setting preloads for bearings A and B so that they will not become unloaded.

Fig. 4.6 Distribution of Preload in Constant Pressure Preload



	Preload (N)			
	Bearing A	Bearing B	Bearing C	Bearing D
Horizontal shaft	250	250	250	250
Vertical shaft	200	200	250	250

(a) Shaft weight = 100 N, Spring 1 = 500 N



	Preload (N)				
	Bearing A	Bearing B	Bearing C	Bearing D	Bearing E
Horizontal shaft	250	250	300	100	100
Vertical shaft	200	200	300	100	100

(b) Shaft weight = 100 N, Spring 1 = 300 N, Spring 2 = 200 N

4. Preload and Rigidity

Preload and Axial Rigidity

Generally, when an axial load F_a is applied to a bearing it is possible to calculate the axial displacement δ_a of the bearing using the following formula:

For angular contact ball bearings: $\delta_a = cF_a^{2/3}$

For tapered roller bearings: $\delta_a = cF_a^{0.9}$

Where c is a constant that depends on the bearing's internal design.

As the displacement is increased by axial load to the 0.9 for tapered roller bearings and the 2/3 for ball bearings, the effect of preload application to reduce displacement is stronger with ball bearings.

The above equation refers to elastic displacement between the rolling elements (balls, tapered rollers) and the inner and outer rings. Actual axial displacement will also depend on the material and the thickness of shaft and housing as well as on shaft fit and housing fit.

Fig. 4.7 Axial Load and Axial Displacement in Single Row Bearings

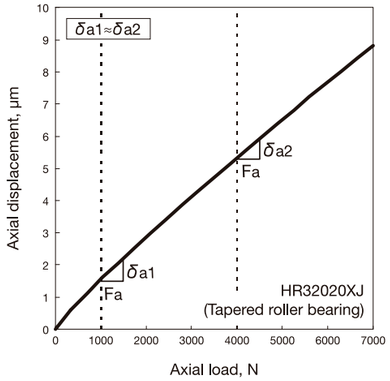
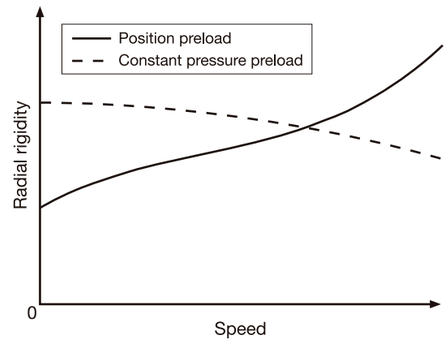


Fig. 4.8 Comparison of Rigidity under each Preloading Method



Comparison of Preloading Methods

Position preload and constant pressure preload can be compared as follows:

(1) Position preload provides greater bearing rigidity than constant pressure preload at the same amount of preload. In other words, the deflection due to external loads is less for bearings with position preload.

(2) Under position preload, the preload varies during operation depending on such factors as a difference in axial expansion due to a temperature difference between the shaft and the housing, a difference in radial expansion due to a temperature difference between the inner and outer rings, and the effect of centrifugal force acting on the rolling elements. Under constant pressure preload, the variation of spring load due to shaft expansion and contraction etc. is minimal, so its effect on preload is negligible.

With position preload, bearing rigidity will generally increase with spindle speed because preload increases during operation. In contrast, the preload level with constant pressure preload will remain constant. However, the contact angle will changes due to centrifugal force acting on the balls (Fig. 1.7 on page 197) and result in a decrease of rigidity (Fig. 4.8).

Consequently, position preloads are generally preferred where increasing rigidity is desired, while constant pressure preloads are more suitable for high-speed applications, for applications where axial vibration needs to be prevented, for use with thrust bearings on horizontal shafts, etc.

Preloading Amount

A larger preload results in higher rigidity. However, increasing preload reduces fatigue life and increases heat generation. In extreme cases, excessive preload may result in abnormal wear or even seizure.

Therefore, the amount of preload needs to be carefully selected taking into consideration the type of application and the operating conditions, to avoid larger preload than necessary.

High-Speed Spindles and Preload

When bearings are operated at high speed, internal load increases as a result of the expansion of the inner ring due to centrifugal force, the effect centrifugal force has on balls, and the temperature difference between inner and outer ring. Then, surface contact pressure between the balls and the raceways of the inner and outer ring will increase. For bearings having a contact angle, such as angular contact ball bearings, pure rolling motion will be accompanied by sliding as a result of spin moments and gyroscopic moments on the balls. Sliding increases as bearing speed increases. As a result, the intensity of heat generated in the contact areas increases and the viscosity of the lubricating oil decreases. In some cases, a breakdown of the oil film occurs, which results in bearing seizure. This means that even if contact surface pressure were to remain unchanged from low-speed operation to high-speed operation, heat generation would still increase as speed increases due to sliding.

We calculate contact surface pressure and slip rate generated during high-speed operation by computer. Based on our own abundant empirical test data as well as market results, we have established limiting factors according to the lubricating method and rotating speed; this is the foundation on which we determine preload.

For high-speed bearings in constant pressure preload, a medium preload (M) per row is commonly chosen as a guideline value and then adjusted according to the required rigidity and the temperature rise in high-speed operation.

Preload for Thrust Bearings

Thrust bearings generally require an axial load in order to prevent slipping between the rolling elements and the washers.

The minimum axial load required to prevent rolling element slippage can be calculated using the equation below. In cases where shaft dead weight is insufficient, a preload needs to be added, e.g. by a spring.

For thrust ball bearings: $F_{a\,min} = Mn^2$

where $F_{a\,min}$: Minimum axial load (kN)
M : Minimum load factor (listed in bearing tables)
n : Maximum speed during operation (min^{-1})

For thrust cylindrical roller bearings: $F_{a\,min} = 0.0005C_{0a} + Mn^2$

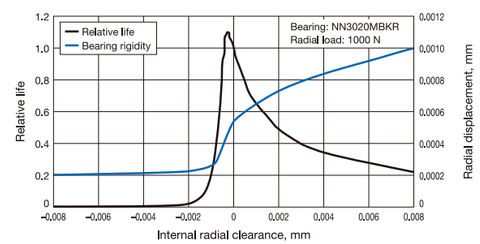
where $F_{a\,min}$: Minimum axial load (kN)
M : Minimum load factor (listed in bearing tables)
C_{0a} : Basic static axial load rating (kN)
n : Maximum speed during operation (min^{-1})

Internal Clearance in Cylindrical Roller Bearings

In order for machine tool spindles to have high running accuracy and rigidity, bearings are used with minimum internal clearance or preload after mounting. When using cylindrical roller bearings, bearings with tapered bores are usually used to allow easier adjustment of internal clearance. In general, cylindrical roller bearings for the front end (fixed end) of the spindle are adjusted upon mounting to have a preload during operation. Bearings for the rear end (free end) are adjusted upon mounting to produce a slight clearance during operation. The amount of internal radial clearance after mounting is determined based on several factors such as speed, load, lubricating method, bearing size, required rigidity, service life, etc.

Fig. 4.9 shows the relationship between internal radial clearance and rolling fatigue life as well as the relationship between internal radial clearance and radial elastic displacement for a cylindrical roller bearing (NN3020, bore diameter 100 mm, outside diameter 150 mm, width 37 mm).

Fig. 4.9 Influence of Internal Radial Clearance on Rolling Fatigue Life and Rigidity in a Double-Row Cylindrical Roller Bearing



5. Limiting Speeds

Limiting Speeds

The limiting speeds listed in the bearing tables are guideline values. They are applicable when all of the following criteria are met:

- A single bearing, appropriately preloaded using springs
- A spindle system controlled for unbalance
- Good heat dissipation
- Good lubrication
- Inner ring rotation

These values are not guaranteed for continuous operation over a prolonged period. Especially in the case of grease lubrication, it is recommended to choose suitable speeds taking grease life into consideration.

The limiting speeds with grease lubrication require appropriate amounts of high quality grease to be applied appropriately as well as sufficient run-in. Refer to page 256 for grease application procedures, page 268 for running-in.

Limiting speeds for oil lubrication are based on oil-air (or oil mist) lubrication. It is possible to achieve higher speeds in cases where oil serves to efficiently remove heat, as in jet lubrication.

In order to achieve high-speed operation, it is necessary to keep bearing load (including internal load), heat generation and temperature increase down. In addition to those mentioned, the following factors also exert an influence on limiting speeds:

(1) Preloading Method

Under position preload, internal preload increases when speed is increased. As a general rule, limiting speed with position preload will be lower than with constant pressure preload.

(2) Bearing Positioning and Arrangement

The number of rows in a combination of bearings affects load distribution. The limiting speed will be determined by the bearing operating under the most stress within a combination. In addition, even under the same preload, heat dissipation will be affected by the presence or absence of spacers and by spacer length.

(3) Bearing Load

High speed and heavy load are difficult to combine. Load endurance is affected by speed.

(4) Drive Method

Spindle drive systems can be classified roughly into three groups: (a) coupling drives (b) built-in motor drives (c) belt or gear drives. (a)High eccentricity in coupling drives leads to shaft vibrations that result in lower limiting speeds. (b)With built-in motor drives, internal heat generation of the spindle is high; so it is especially bearings located near the motor that could be affected and damaged by heat. In spindles equipped with jacket cooling, the temperature difference between the inner ring and the outer ring of the bearing will likely increase; in the case of position preload this results in the internal load increasing, which in turn means lower limiting speeds (Fig. 5.2). (c)In gear or belt drives, the driving force itself may have to be considered. Caution is required with high-torque spindles and high-speed spindles in particular.

Table 5.1 Speed Factors for Position Preload

	Arrangement	Preload after mounting			
		EL	L	M	H
DB		0.85	0.80	0.65	0.55
DBB		0.80	0.75	0.60	0.45
DBD		0.75	0.70	0.55	0.40
DBBD		0.75	0.70	0.55	0.40

(5) Mounting Conditions

In the case of position preload, the shaft fit will affect preload. Spacer length and tightening force also affect bearing clearance, thereby changing preload.

Housing fit conditions will greatly influence preload, particularly during operation. Too little clearance between bearing and housing will lead to an interference fit due to the difference in heat expansion between bearing and housing; this increases internal preload (Fig. 5.3).

If cylindrical roller bearings are mounted with excessive negative clearance, the limiting speed will decline due to rising heat generation. (page 46)

Speed Factors for Position Preload

The limiting speed of a combination of angular contact ball bearings is calculated by multiplying the limiting speed of a single bearing in the combination by the appropriate adjustment factor listed in Table 5.1. The preload classification in the table refers to the preload after the bearings have been attached to the spindle (i.e. preload after mounting).

Usually, preload after mounting is affected by shaft fit and spacer deformation and may exceed that resulting from initial axial clearance. For example, an EL preloaded bearing mounted with high interference, may have a preload after mounting that is equivalent to an M preload. It will be necessary to adjust axial clearance using spacers according to the conditions in which the bearings are used.

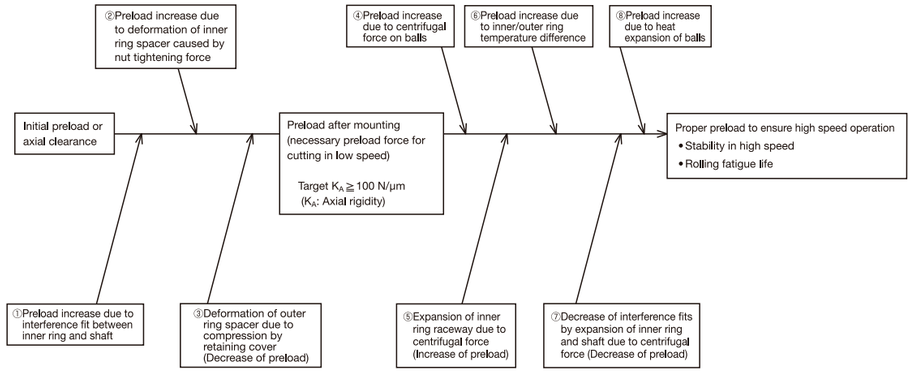
In order to maintain stable operation over time, it is advisable to reduce the values given in Table 5.1 further by a safety factor of 0.75.

Calculation example:

Target value for 70BNR10HTDB, EL preload after mounting, grease lubrication:(limiting speed) 20000 × (EL) 0.85 × (safety factor) 0.75 = 12750min^{-1}

Factors that Change Preload

Fig. 5.1 Preload Setting Study Flow



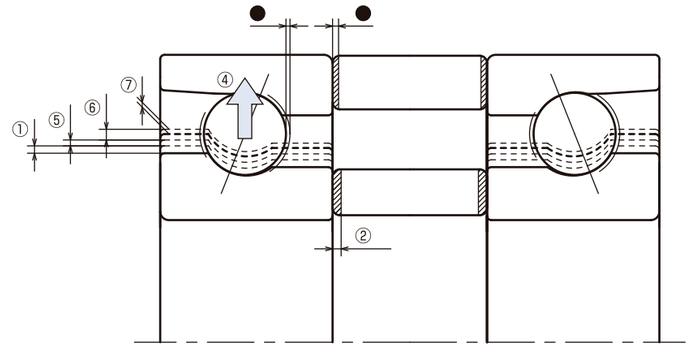


Fig. 5.2 The Influence of the Jacket Cooling on Limiting Speed

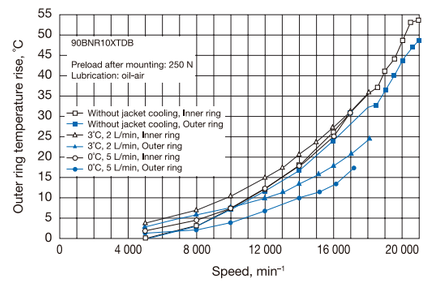
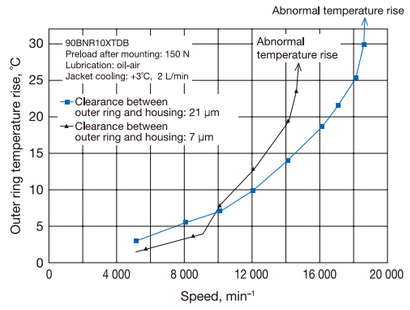


Fig. 5.3 The Influence of the Clearance between the Bearing & the Housing on Limiting Speed



6. Lubrication

Purposes of Lubrication

The main purpose of lubrication is to reduce friction and wear inside the bearing and thereby to prevent seizure. The effects of lubrication may be briefly explained as follows:

(1) Reduction of Friction and Wear

Direct metallic contact between the bearing rings, rolling elements, and cage, which are the basic parts of a bearing, is prevented by an oil film which reduces the friction and wear in the contact areas.

(2) Extension of Fatigue Life

Appropriate lubrication of the rolling contact surfaces extends the rolling fatigue life of bearings. This requires suitable viscosity of the lubricant. If the viscosity of the oil is too low so the film thickness is insufficient, rolling fatigue life will be shortened.

(3) Dissipation of Heat

Circulating lubrication may be employed to remove frictional heat or heat transferred to the bearing from the outside. This prevents the bearing from overheating and the lubricant itself from deteriorating.

(4) Others

Adequate lubrication also helps to prevent foreign material from entering the bearings and guards against corrosion or rusting.

Lubricating Methods

For machine tool spindles in which high accuracy is important, it is necessary to prevent excessive temperature rise of the spindle to reduce thermal deformation.

Bearing heat generation is divided into a load term determined by the bearing type and load, and a speed term determined by the lubricating method and speed.

Generally, the speed term is greater, but if a lubricating method resulting in a small speed term is selected, the influence of the load term cannot be disregarded. Therefore, it is important to select a low heat generating bearing (load term) and lubricating method (speed term).

Regarding heat generation, both the lubricating method and the quantity of lubricant have important effects. Lubrication using a small amount of grease is common since this method is economical, maintenance free, and there is little heat generation. The oil-air lubricating method requiring a minimum quantity of oil was developed to maintain a constant low temperature in conjunction with high speeds. Refer to Table 6.1. for a comparison of lubricating methods.

The relation between oil quantity and heat generation (frictional loss) and temperature rise is already known as shown in Fig. 6.1. In zone A, oil is employed in the minimal quantity necessary. This minimizes agitation resistance and the amount of associated heat generation. However, caution is required since oil quantities lower than zone A pose the risk of insufficient lubrication causing heat increase and bearing failure.

In zone B, the oil quantity is higher which means more heat is generated due to oil agitation. However, once a certain quantity is exceeded, temperature decreases as the oil transports some of the heat away from the bearing.

In this case, the amount of oil needed depends on the oil drain features of the machine, allowable temperature, heat dissipation, and the heat generation characteristics of the oil due to agitation resistance. The adequate oil amount is thus often determined empirically.

Dynamic friction torque of bearing (heat generation)

$M = Ml + Mv$

- Load term (Determined by bearing type and load)

  $Ml = f_1 F d_m$

  where f_1 : Coefficient determined by bearing type and load
  F : Load
  d_m : Pitch circle diameter of rolling element

- Speed term (Determined by oil Viscosity, oil amount, and speed)

  $Mv = f_0 (\nu_0 n)^{2/3} dm^3$

  where f_0 : Coefficient determined by bearing and lubricating method
  ν_0 : Kinematic viscosity of oil
  n : Speed

Fig. 6.1 Oil Quantity and Temperature Rise

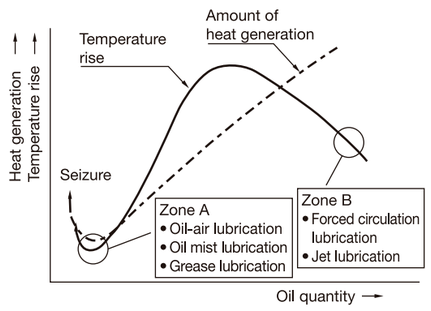


Table 6.1 Comparison of Lubricating Methods

Lubricating Method	Advantages	Disadvantages
Grease Lubrication	☐ Cost is low. ☐ Limitation of temperature rise is possible. ☐ Maintenance free.	☐ If packed grease deteriorates, seizure may occur. ☐ May allow penetration of dust or cutting fluid.
Oil Mist Lubrication	☐ Since new oil is always fed, no fear of oil deterioration. ☐ Dust and cutting fluid cannot easily enter.	☐ Pollution of environment. ☐ Oil supply quantity varies depending on the oil viscosity and temperature, so control of a small flow rate is difficult. ☐ It is difficult to confirm that oil is actually fed.
Oil-Air Lubrication	☐ Since oil quantity control is possible, the optimum quantity of oil is fed and heat generation is low. ☐ Besides little heat-generation, there is a cooling effect of the air, so the temperature rise low. ☐ Since new oil is always fed, no fear of oil deterioration. ☐ Dust, cutting fluid cannot easily enter. ☐ Environmental pollution mist is slight.	☐ Cost is rather high. ☐ Confirmation of whether oil is actually fed to bearing is difficult.
Jet Lubrication	☐ Since the oil flow rate is high, dust and cutting fluid cannot enter and seizure hardly ever occurs. ☐ Because of cooling by oil, the bearing temperature can be controlled to some degree.	☐ Frictional loss is high. ☐ Since oil leaks, it is difficult to use for vertical spindles. ☐ Cost is high.

Grease Lubrication

(1) Recommended Greases

For grease lubrication of bearings in high-speed machine tool spindles that require low temperature rise and long life, a consistency No.2 or No.3 grease with a synthetic base oil (diester, diester + mineral oil, etc.) is recommended.

Table 6.2 lists the brand names and properties of greases widely used in machine tool spindles and ball screw support bearings.

Grease life depends to a large degree upon operating temperature. Therefore, it is necessary to keep the temperature of the bearing (including atmospheric temperature) cool in order to extend grease life.

(2) Grease Quantities for High-Speed Spindle Bearings

To operate bearings at high speed with grease lubrication, the recommended quantity to be packed is 10% to 30% of internal space. If too much grease is packed, abnormal heat generation occurs especially during running-in; this may cause the grease to deteriorate. To avoid such a risk, it is necessary to run in spindles for a sufficient time. Based on accumulated experience,

(3) Grease Quantities for Ball Screw Support Bearings

As bearings for ball screw support are usually operated at slow speed, under high load, and in intermittent operation, we recommend a grease quantity of 30% to 55% of internal space for increased reliability. Recommended grease quantities for each bearing are listed in the bearing tables for ball screw support bearings.

Table 6.2 Grease Brand Names and Properties

Brand Name	Thickener	Base Oil	Base Oil Viscosity, mm^2/s (40℃)	Dropping Point (℃)	Working (1) Temperature Range (℃)	Main Applications
MTE Grease	Barium complex	Mineral oil + Ester oil (3)	23	>260	-20 to +130	Bearings for high-speed spindles
MTS Grease	Urea (2)	Poly-α-olefin+Ester oil (3)	22	>220	-40 to +130	Bearings for high-speed spindles
TURMOGREASE HIGHSPEED L252	Lithium soap	Poly-α-olefin+Ester oil (3)	25	>250	-50 to +120	Bearings for high-speed spindles
ISOFLEX NBU15	Barium complex	Mineral oil + Ester oil (3)	23	>260	-20 to +120	Bearings for spindles
STABURAGS NBU 8 EP	Barium complex	Mineral oil	105	>220	-10 to +130	Bearings for high load spindles
EA7 Grease	Urea (2)	Poly-α-olefin oil	46	>260	-40 to +160	Bearings for motors
ENS Grease	Urea (2)	Polyol ester oil (3)	30.5	>260	-40 to +160	Bearings for motors
Alvania S2	Lithium	Mineral oil	130	185	-10 to +110	Ball screw support bearings
WPH	Urea (2)	Poly-α-olefin oil	95.8	259	-40 to +150	Ball screw support bearings
FS2	Lithium soap	Mineral oil	139	205	-10 to +110	Ball screw support bearings, heavy load applications
Multemp PS No. 2	Lithium soap	Poly- α -olefin + Diester oil (3)	15.9	190	-50 to +110	Ball screw support bearings, light load applications
Klüberplex BEM 41-132	Lithium soap	Mineral oil + Poly-α-olefin oil	120	>250	-40 to +150	Ball screw support bearings (standard grease for BSBD Series)

(1) For special application environments such as operating temperatures close to the low end or high end of the range or vacuum etc.,
(2) Caution: Grease containing urea thickener degrades fluorine-based materials.
(3) Caution: Ester oil-based grease causes acrylic materials to swell.

6. Lubrication

Oil Lubrication

For oil lubrication of bearings, highly purified mineral and synthetic oils with good anti-oxidative and anti-corrosive properties are used that perform well under high loads.

The most important factor to consider when choosing lubricating oil is the viscosity it will exhibit at operating temperature. If viscosity is too low, the oil film will be insufficient which may cause abnormal wear and seizure. If viscosity is too high, the agitation resistance of the oil will generate more heat and lead to power loss. Oil film formation is also influenced by operating speed and load conditions.

Generally, the higher the operating speed the lower the viscosity of the oil used. The higher the bearing load, or the larger the size of the bearing, the higher the viscosity of the oil used. Table 6.3 shows guideline values for oil viscosity at oil temperatures in the vicinity of operated bearings under normal operating conditions.

To aid your selection of lubricating oil, Fig. 6.2 shows the relationship between oil temperature and viscosity.

(1) Oil Mist and Oil-Air Lubrication (Minimal Oil Quantity Lubrication)

Oil mist lubrication is a method of spraying oil by turning it into a mist using compressed air.

Oil-air lubrication is a method of feeding oil continuously by injecting oil into a compressed air stream by means of a mixing valve that intermittently discharges the minimum quantity of oil using a constant-quantity piston. Fig. 6.3 shows the recommended oil quantity for these minimal oil quantity lubrication methods; each quantity is for one bearing. In the case of oil mist lubrication, it is necessary to adjust the oil quantity to accommodate the effects of the branches in distribution tubing and leakage from the gaps around the spacers.

Fig. 6.2 Relationship of Viscosity and Temperature of Lubricating Oil

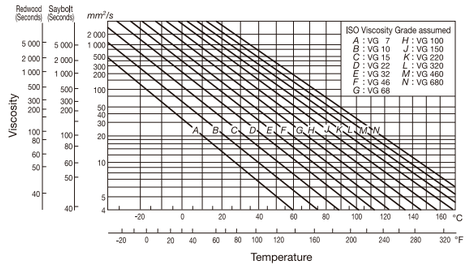


Fig. 6.3 Recommended Oil Quantity for Each Bore Size of Bearing (Minimal Oil Quantity Lubrication)

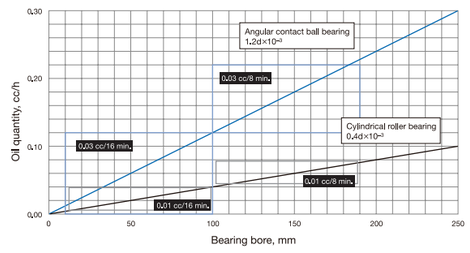
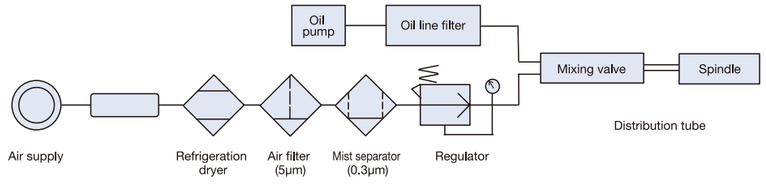


Fig. 6.4 Oil-air Lubrication System (Example)



Example of an oil-air lubrication system

Air supply
- Clean and dry compressed air
- Dew point 3°C or lower
- Air pressure: 0.2 to 0.5 MPa (0.4 to 0.45 recommended)

Lubricating oil
- Clean high-speed spindle oil, or turbine oil (With online filter, if needed)
- Viscosity:22 to 68cst

Distributing tube for oil-air
- Length of distribution tubing: 1.5 to 5 m (3.5 to 5 m recommended)
- Inner diameter of distribution tubing: 2 to 2.5 mm (transparent urethane tube with 4mm outer diameter etc.)

Please refer to the instruction manual of your lubrication device manufacturer etc. for details.

Table 6.3 Required Viscosity of Lubricating Oil for Each Bearing Type

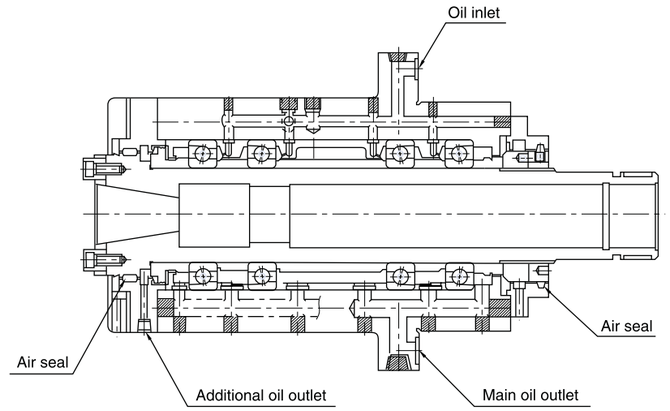
Bearing Type	Kinematic Viscosity during Operation
Ball bearings, Cylindrical roller bearings	13 cSt or higher
Tapered roller bearings	20 cSt or higher

(2) Jet Lubrication

Jet lubrication is mainly used for high-speed bearings with a $d_m n$ value of more than 1.0×10^6. Jets of lubricating oil pass through the bearings via one or several nozzles at a constant pressure. In high-speed applications, the air surrounding the bearing rotates together with the bearing and forms a wall of air. The speed of the jet from each nozzle must exceed the circumferential speed of the inner ring outside surface by at least 20%. To cool bearings and shaft down uniformly, it proves advantageous to increase the number of nozzles. Enlarging the oil discharge outlet or employing forced discharge should also be considered so as to improve heat removal.

Though it increases equipment size, this method is used for machine tool spindle bearings in some applications as a means of achieving stable operation at ultra-high speeds (see Fig. 6.5).

Fig. 6.5 Jet Lubrication Spindle (Example)



Oil Amount in Forced-Circulation Lubrication

The empirical equation below can be used to estimate the amount of oil needed for a bearing with forced-circulation lubrication.00000

$$Q = \frac{0.19 \times 10^{-5}}{T_2 - T_1} d\mu n F \text{ (N)} \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

where Q : Oil supply rate (liters/min)
T_1 : Oil temperature at oil inlet (°C)
T_2 : Oil temperature at oil outlet (°C)
d : Bearing bore (mm)
μ : Dynamic friction coefficient (guideline value, determined by bearing type, see Table 6.4)
n : Bearing speed (min^{-1})
F : Bearing load (N)

Table 6.4 Dynamic Friction Coefficient (Guideline Values)

Bearing Type	Coefficient μ
Angular contact ball bearings	0.0015
Thrust ball bearings	0.0011
Cylindrical roller bearings	0.0010
Tapered roller bearings	0.0022
Thrust cylindrical roller bearings	0.0040

The value calculated from equation (1) is a guideline only and may be modified after considering such factors as the restrictions on oil inlet and oil outlet bore sizes.

Note that the oil drain pipe and oil outlet bore must be designed large enough to prevent stagnation of the circulating oil in the housing.

The oil amount obtained from equation (1) is too large for large bearings (bore sizes of more than 200 mm) if they are exposed to heavy loads. In these cases a value of about 2/3 to 1/2 of the calculated value should be taken as a guideline and the final value determined after having been confirmed on the actual machine.

7. Bearing Tolerances

The tolerance for the boundary dimensions and running accuracy of MONTON radial bearings are specified by the Accuracies of Rolling Bearings in ISO 492/199/582/1132-1, and Rolling Bearing Tolerances in JIS B 1514. In addition to the above tolerances, MONTON manufactures angular contact ball bearings with precision classes ABEC 5, 7, and 9.

Rough definitions of the items listed for running accuracy and their measuring methods are described in Table 7.1 and Fig 7.1.

Table 7.1

Running Accuracy		Inner Ring	Outer Ring	Dial Gauge
Radial runout of inner ring of assembled bearing	K_{ia}	Rotating	Stationary	A
Radial runout of outer ring of assembled bearing	K_{ea}	Stationary	Rotating	A
Axial runout of inner ring of assembled bearing	S_{ia}	Rotating	Stationary	B_1
Axial runout of outer ring of assembled bearing	S_{ea}	Stationary	Rotating	B_2
Perpendicularity of inner ring face surface with respect to the bore	S_d	Rotating	Stationary	C
Perpendicularity of outer ring outside surface with respect to the face	S_D	—	Rotating	D
Variation in thickness between shaft washer (housing washer) raceway and back face	S_i, S_e	Only the shaft washer or the housing washer is to be rotated		E

Tolerances for Radial Bearings (excluding Tapered Roller Bearings)

Inner Ring

Table 7.2 Inner Ring (Class 5)

Unit: μm

Nominal Bore Diameter d (mm)		Deviation of Mean Bore Dia. in a single plane Δ_{dmp} (²)		Bore Dia. Variation in a Single Radial Plane V_{dp} (²)		Mean Bore Dia. Variation V_{dmp} (²)	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia} (⁴)	Deviation of Single Inner Ring Width Δ_{Bs}			Inner Ring Width Variation V_{Bs}
				Diameter Series						Single Bearing Combined Bearing	Single Bearing	Combined Bearing (¹)	
				9	0, 2, 3								
Over	Incl.	High	Low	Max.		Max.	Max.	Max.	Max.	High	Low		Max.
2.5	**10**	0	− 5	5	4	3	4	7	7	0	− 40	− 250	5
10	**18**	0	− 5	5	4	3	4	7	7	0	− 80	− 250	5
18	**30**	0	− 6	6	5	3	4	8	8	0	− 120	− 250	5
30	**50**	0	− 8	8	6	4	5	8	8	0	− 120	− 250	5
50	**80**	0	− 9	9	7	5	5	8	8	0	− 150	− 250	6
80	**120**	0	− 10	10	8	5	6	9	9	0	− 200	− 380	7
120	**180**	0	− 13	13	10	7	8	10	10	0	− 250	− 380	8
180	**250**	0	− 15	15	12	8	10	11	13	0	− 300	− 500	10
250	**315**	0	− 18	18	14	9	13	13	15	0	− 350	− 500	13
315	**400**	0	− 23	23	18	12	15	15	20	0	− 400	− 630	15

Table 7.3 Inner Ring (Class 4)

Unit: μm

Nominal Bore Diameter d (mm)		Single plane mean bore Dia. deviation Δ_{dmp} (²)		Deviation of a Single Bore Dia. Δ_{dS} (²)		Bore Dia. Variation in a Single Radial Plane V_{dp} (²)		Mean Bore Dia. Variation V_{dmp} (²)	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia} (⁴)	Deviation of Single Inner Ring Width Δ_{Bs}			Inner Ring Width Variation V_{Bs}
						Diameter Series						Single Bearing Combined Bearing	Single Bearing	Combined Bearing (¹)	
						9	0, 2, 3								
Over	Incl.	High	Low	High	Low	Max.		Max.	Max.	Max.	Max.	High	Low		Max.
2.5	**10**	0	− 4	0	− 4	4	3	2	2.5	3	3	0	− 40	− 250	2.5
10	**18**	0	− 4	0	− 4	4	3	2	2.5	3	3	0	− 80	− 250	2.5
18	**30**	0	− 5	0	− 5	5	4	2.5	3	4	4	0	− 120	− 250	2.5
30	**50**	0	− 6	0	− 6	6	5	3	4	4	4	0	− 120	− 250	3
50	**80**	0	− 7	0	− 7	7	5	3.5	4	5	5	0	− 150	− 250	4
80	**120**	0	− 8	0	− 8	8	6	4	5	5	5	0	− 200	− 380	4
120	**180**	0	− 10	0	− 10	10	8	5	6	6	7	0	− 250	− 380	5
180	**250**	0	− 12	0	− 12	12	9	6	8	7	8	0	− 300	− 500	6

(¹) Applicable to individual rings manufactured for combined bearings.

(²) Applicable to bearings with cylindrical bores.

(³) Class 3 is MONTON's original accuracy. Tolerance of bearing bore diameter and outer ring outer diameter are Class 4. Other tolerances are Class 2.

(⁴) Applicable to ball bearings.

Remarks: 1. The bore diameter tolerance limit (High) for bearings with cylindrical bores, as specified in this table, is not necessarily applicable within a distance of 1.2 times the chamfer dimension r (Max.) from the ring face.

2. Standards ABEC5, ABEC7, and ABEC9 are equivalent to ISO Classes 5, 4, and 2 respectively. Standards are applicable to angular contact ball bearings.

MONTON

Fig. 7.1 Measuring Methods for Running Accuracy

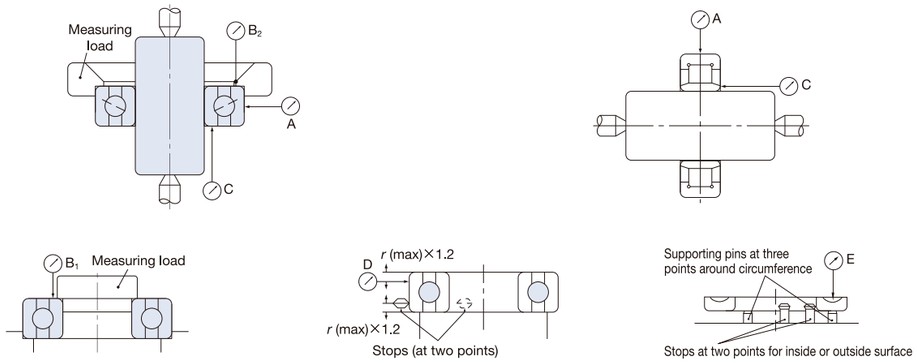


Table 7.4 Inner Ring (Class 3) (³)

Unit: μm

Nominal Bore Diameter d (mm)		Single Plane Mean Bore Dia. Deviation Δ_{dmp} (²)		Deviation of a Single Bore Dia. Δ_{dS} (²)		Bore Dia. Variation in a Single Radial Plane V_{dp} (²)	Mean Bore Dia. Variation V_{dmp} (²)	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia} (⁴)	Deviation of Single Inner Ring Width Δ_{Bs}			Inner Ring Width Variation V_{Bs}
											Single Bearing Combined Bearing	Single Bearing	Combined (¹) Bearing	
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.	High	Low		Max.
2.5	**10**	0	− 4	0	− 4	2.5	1.5	1.5	1.5	1.5	0	− 40	−250	1.5
10	**18**	0	− 4	0	− 4	2.5	1.5	1.5	1.5	1.5	0	− 80	−250	1.5
18	**30**	0	− 5	0	− 5	2.5	1.5	2.5	1.5	2.5	0	− 120	−250	1.5
30	**50**	0	− 6	0	− 6	2.5	1.5	2.5	1.5	2.5	0	− 120	−250	1.5
50	**80**	0	− 7	0	− 7	4	2	2.5	1.5	2.5	0	− 150	−250	1.5
80	**120**	0	− 8	0	− 8	5	2.5	2.5	2.5	2.5	0	− 200	−380	2.5
120	**150**	0	− 10	0	− 10	7	3.5	2.5	2.5	2.5	0	− 250	−380	2.5
150	**180**	0	− 10	0	− 10	7	3.5	5	4	5	0	− 250	−380	4
180	**250**	0	− 12	0	− 12	8	4	5	5	5	0	− 300	−500	5

Table 7.5 Inner Ring (Class 2)

Unit: μm

Nominal Bore Diameter d (mm)		Single Plane Mean Bore Dia. Deviation Δ_{dmp} (²)		Deviation of a Single Bore Dia. Δ_{dS} (²)		Bore Dia. Variation in a Single Radial Plane V_{dp} (²)	Mean Bore Dia. Variation V_{dmp} (²)	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia} (⁴)	Deviation of Single Inner Ring Width Δ_{Bs}			Inner Ring Width Variation V_{Bs}
											Single Bearing Combined Bearing	Single Bearing	Combined (¹) Bearing	
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.	High	Low		Max.
2.5	**10**	0	− 2.5	0	− 2.5	2.5	1.5	1.5	1.5	1.5	0	− 40	− 250	1.5
10	**18**	0	− 2.5	0	− 2.5	2.5	1.5	1.5	1.5	1.5	0	− 80	− 250	1.5
18	**30**	0	− 2.5	0	− 2.5	2.5	1.5	2.5	1.5	2.5	0	− 120	− 250	1.5
30	**50**	0	− 2.5	0	− 2.5	2.5	1.5	2.5	1.5	2.5	0	− 120	− 250	1.5
50	**80**	0	− 4	0	− 4	4	2	2.5	1.5	2.5	0	− 150	− 250	1.5
80	**120**	0	− 5	0	− 5	5	2.5	2.5	2.5	2.5	0	− 200	− 380	2.5
120	**150**	0	− 7	0	− 7	7	3.5	2.5	2.5	2.5	0	− 250	− 380	2.5
150	**180**	0	− 7	0	− 7	7	3.5	5	4	5	0	− 250	− 380	4
180	**250**	0	− 8	0	− 8	8	4	5	5	5	0	− 300	− 500	5

Inner ring (Class 4Y)

Table 7.6 Tolerance of Bore Diameter of Inner Ring

Unit: μm

Bore diameter (mm)		Class 4		Class 4Y (Controlled to medium value)	
Over	Incl.	High	Low	High	Low
30	**50**	0	− 6	− 1	− 3
50	**80**	0	− 7	− 2	− 5
80	**120**	0	− 8	− 3	− 6
120	**150**	0	− 10	− 3	− 7

* Class 4Y is MONTON's proprietary accuracy standard, in which tolerance of bearing bore diameter and outer ring outer diameter are in a special class (controlled to medium value) and running accuracy is Class 4. Since variation of bearing bore diameter and outer ring outer diameter is minimized, P4Y is the most suitable accuracy class for universal combination bearings.

7. Bearing Tolerances

Tolerances for Radial Bearings (excluding Tapered Roller Bearings)

Outer Ring

Table 7.7 Outer Ring (Class 5) Unit: μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Dia. Deviation Δ_{Dmp}		Outside Dia. Variation in a Single Radial Plane V_{Dp}		Mean Outside Dia. Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea} (1)	Deviation of Single Outer Ring Width Δ_{Cs}	Outer Ring Width Variation V_{Cs}
				Diameter Series							
				9	0, 2						
Over	Incl.	High	Low	Max.		Max.	Max.	Max.	Max.		Max.
6	**18**	0	− 5	5	4	3	5	8	8		5
18	**30**	0	− 6	6	5	3	6	8	8		5
30	**50**	0	− 7	7	5	4	7	8	8		5
50	**80**	0	− 9	9	7	5	8	8	10		6
80	**120**	0	− 10	10	8	5	10	9	11	Equal to the value of inner ring (Δ_{Bs}) of the same bearing number.	8
120	**150**	0	− 11	11	8	6	11	10	13		8
150	**180**	0	− 13	13	10	7	13	10	14		8
180	**250**	0	− 15	15	11	8	15	11	15		10
250	**315**	0	− 18	18	14	9	18	13	18		11
315	**400**	0	− 20	20	15	10	20	13	20		13
400	**500**	0	− 23	23	17	12	23	15	23		15
500	**630**	0	− 28	28	21	14	25	18	25		18
630	**800**	0	− 35	35	26	18	30	20	30		20

Table 7.8 Outer Ring (Class 4) Unit: μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Dia. Deviation Δ_{Dmp}		Deviation of Single Outside Dia. Δ_{Ds}		Outside Dia. Variation in a Single Radial Plane V_{Dp}		Mean Outside Dia. Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea} (1)	Deviation of Single Outer Ring Width Δ_{Cs}	Outer Ring Width Variation V_{Cs}
						Diameter Series							
						9	0, 2						
Over	Incl.	High	Low	High	Low	Max.		Max.	Max.	Max.	Max.		Max.
6	**18**	0	− 4	0	− 4	4	3	2	3	4	5		2.5
18	**30**	0	− 5	0	− 5	5	4	2.5	4	4	5		2.5
30	**50**	0	− 6	0	− 6	6	5	3	5	4	5		2.5
50	**80**	0	− 7	0	− 7	7	5	3.5	5	4	5		3
80	**120**	0	− 8	0	− 8	8	6	4	6	5	6		4
120	**150**	0	− 9	0	− 9	9	7	5	7	5	7		5
150	**180**	0	− 10	0	− 10	10	8	5	8	5	8	Equal to the value of inner ring (Δ_{Bs}) of the same bearing number.	5
180	**250**	0	− 11	0	− 11	11	8	6	10	7	10		7
250	**315**	0	− 13	0	− 13	13	10	7	11	8	10		7
315	**400**	0	− 15	0	− 15	15	11	8	13	10	13		8

(1) Applicable to ball bearings.

(2) MONTON specification. Tolerance of bearing bore diameter and outer ring outer diameter are Class 4. Other tolerances are Class 2.

Table 7.9 Outer Ring (Class 3) (2) Unit: μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Dia. Deviation Δ_{Dmp}		Deviation of Single Outside Dia. Δ_{Ds}		Outside Dia. Variation in a Single Radial Plane V_{Dp}	Mean Outside Dia. Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea} (1)	Deviation of Single Outer Ring Width Δ_{Cs}	Outer Ring Width Variation V_{Cs}
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.		Max.
6	**18**	0	− 4	0	− 4	2.5	1.5	1.5	1.5	1.5		1.5
18	**30**	0	− 5	0	− 5	4	2	2.5	1.5	2.5		1.5
30	**50**	0	− 6	0	− 6	4	2	2.5	1.5	2.5	Equal to the	1.5
50	**80**	0	− 7	0	− 7	4	2	4	1.5	4	value of inner	1.5
80	**120**	0	− 8	0	− 8	5	2.5	5	2.5	5	ring (Δ_{Bs}) of	2.5
120	**150**	0	− 9	0	− 9	5	2.5	5	2.5	5	the same	2.5
150	**180**	0	− 10	0	− 10	7	3.5	5	2.5	5	bearing	2.5
180	**250**	0	− 11	0	− 11	8	4	7	4	7	number.	4
250	**315**	0	− 13	0	− 13	8	4	7	5	7		5
315	**400**	0	− 15	0	− 15	10	5	8	7	8		7

Table 7.10 Outer Ring (Class 2) Unit: μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Dia. Deviation Δ_{Dmp}		Deviation of Single Outside Dia. Δ_{Ds}		Outside Dia. Variation in a Single Radial Plane V_{Dp}	Mean Outside Dia. Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea} (1)	Deviation of Single Outer Ring Width Δ_{Cs}	Outer Ring Width Variation V_{Cs}
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.		Max.
6	**18**	0	− 2.5	0	− 2.5	2.5	1.5	1.5	1.5	1.5		1.5
18	**30**	0	− 4	0	− 4	4	2	2.5	1.5	2.5		1.5
30	**50**	0	− 4	0	− 4	4	2	2.5	1.5	2.5	Equal to the	1.5
50	**80**	0	− 4	0	− 4	4	2	4	1.5	4	value of inner	1.5
80	**120**	0	− 5	0	− 5	5	2.5	5	2.5	5	ring (Δ_{Bs}) of	2.5
120	**150**	0	− 5	0	− 5	5	2.5	5	2.5	5	the same	2.5
150	**180**	0	− 7	0	− 7	7	3.5	5	2.5	5	bearing	2.5
180	**250**	0	− 8	0	− 8	8	4	7	4	7	number.	4
250	**315**	0	− 8	0	− 8	8	4	7	5	7		5
315	**400**	0	− 10	0	− 10	10	5	8	7	8		7

Outer Ring (Class 4Y)

Table 7.11 Tolerance of Outer Diameter of Outer Ring Unit: μm

Outer diameter (mm)		Class 4		Class 4Y (Controlled to medium value)	
Over	Incl.	High	Low	High	Low
30	**50**	0	− 6	−2	−6
50	**80**	0	− 7	−2	−6
80	**120**	0	− 8	−2	−6
120	**150**	0	− 9	−3	−7
150	**180**	0	−10	−3	−7
180	**200**	0	−11	−4	−9
200	**215 and less**	0	−11	−2	−9

* Class 4Y is MONTON's proprietary accuracy standard, in which tolerance of bearing bore diameter and outer ring outer diameter are in a special class (controlled to medium value) and running accuracy is Class 4. Since variation of bearing bore diameter and outer ring outer diameter is minimized, P4Y is the most suitable accuracy class for universal combination bearings.

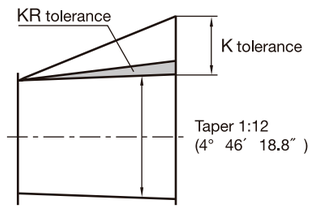
7. Bearing Tolerances

Tolerances for Tapered Bores of Cylindrical Roller Bearings

Tolerances for Tapered Bores

The bore accuracy of tapered bore cylindrical roller bearings is specified by ISO. However, in this standard, the tolerances are rather wide.

Fig. 7.2 Taper Angle Tolerances

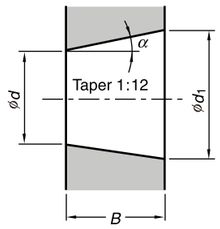


KR : A very narrow range positioned towards the lower limit of ISO tolerance for easier adjustment of taper angle during mounting.

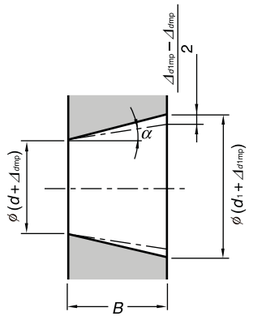
K : Positioned midrange of ISO tolerance, this accuracy class offers bore dimensional accuracy identical to the ISO specification.

Fig. 7.3 Tapered Bore Tolerances

Nominal tapered bore



Tapered bore with deviation in single plane mean bore diameter



d : Nominal bore diameter

d_1 : Theoretical diameter of larger end of tapered bore
$d_1 = d + \frac{1}{12}B$

Δ_{dmp} : Deviation of single plane mean bore diameter of smaller end of tapered bore from the nominal diameter

Δ_{d1mp} : Deviation of single plane mean bore diameter of larger end of tapered bore from the theoretical diameter

V_{dp} : Bore diameter variation in a single radial plane

B : Nominal inner ring width

α : Half of taper angle of tapered bore
$\alpha = 2°23'9.4''$
$= 2.38594°$
$= 0.041643\text{rad}$

Table 7.12 KR Tapered Bores — Unit: μm

d (1) (mm)		Δ_{dmp}		(Reference) (2) $\Delta_{d1mp}-\Delta_{dmp}$		V_{dp} (2)
Over	Incl.	High	Low	High	Low	Max.
18	**30**	+ 13	0	+ 3	0	4
30	**50**	+ 16	0	+ 3	0	5
50	**80**	+ 19	0	+ 4	0	6
80	**120**	+ 22	0	+ 5	0	7
120	**180**	+ 25	0	+ 7	0	9
180	**250**	+ 29	0	+ 9	0	12
250	**315**	+ 32	0	+ 11	0	14
315	**400**	+ 36	0	+ 12	0	16

(1) For bearings with larger than 400mm bore, please contact.

(2) Bore diameter variation in a single radial plane, which is applicable to all radial planes of tapered bores.

(3) Taper angular tolerance, $4°46'18.8'' {}^{+25''}_{0}$

Table 7.13 K Tapered Bores — Unit: μm

d (mm)		Δ_{dmp}		$\Delta_{d1mp}-\Delta_{dmp}$		V_{dp} (1)
Over	Incl.	High	Low	High	Low	Max.
18	**30**	+ 33	0	+ 21	0	13
30	**50**	+ 39	0	+ 25	0	16
50	**80**	+ 46	0	+ 30	0	19
80	**120**	+ 54	0	+ 35	0	22
120	**180**	+ 63	0	+ 40	0	40
180	**250**	+ 72	0	+ 46	0	46
250	**315**	+ 81	0	+ 52	0	52
315	**400**	+ 89	0	+ 57	0	57
400	**500**	+ 97	0	+ 63	0	63
500	**630**	+ 110	0	+ 70	0	70
630	**800**	+ 125	0	+ 80	0	–

(1) Bore diameter variation in a single radial plane, which is applicable to all radial planes of tapered bores.

7. Bearing Tolerances

Tolerances for Angular Contact Thrust Ball Bearings

Tolerances for angular contact thrust ball bearings (Class 4A [1]) of BAR, BTR, TAC2xF types)

Table 7.14 Inner ring

Unit: μm

Nominal Bore Diameter d (mm)		Single Plane Mean Bore Dia. Deviation Δ_{dmp}		Deviation of a Single Bore Dia. Δ_{ds}		Bore Dia. Variation in a Single Radial Plane V_{dp}		Mean Bore Dia. Variation V_{dmp}	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia}	Inner Ring Width Variation V_{Bs}	Deviation of Single Inner Ring Width Δ_{Bs}	
						Diameter Series							Combined Bearing	
						9	0							
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.	Max.	Max.	High	Low
–	**50**	0	– 6	0	– 6	6	5	3	4	4	4	3	0	– 250
50	**80**	0	– 7	0	– 7	7	5	3.5	4	5	5	4	0	– 250
80	**120**	0	– 8	0	– 8	8	6	4	5	5	5	4	0	– 380
120	**150**	0	– 10	0	– 10	10	8	5	6	6	7	5	0	– 380
150	**180**	0	– 10	0	– 10	10	8	5	6	6	7	5	0	– 500
180	**250**	0	– 12	0	– 12	12	9	6	8	7	8	6	0	– 500

Table 7.15 Outer ring

Unit: μm

Nominal Outside Diameter D (mm)		Single Plane Mean Outside Dia. Deviation Δ_{Dmp}		Deviation of Single Outside Dia. Δ_{Ds}		Outside Dia. Variation in a Single Radial Plane V_{Dp}		Mean Outside Dia. Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea}	Outer Ring Width Variation V_{Cs}	Deviation of Single Outer Ring Width Δ_{Cs}	
						Diameter Series							Combined Bearing	
						9	0							
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.	Max.	Max.	High	Low
–	**80**	– 30	– 37	– 30	– 37	7	5	3.5	5	4	5	3	Equal to the value of inner ring (Δ_{Bs}) of the same bearing number.	
80	**120**	– 40	– 48	– 40	– 48	8	6	4	6	5	6	4		
120	**150**	– 50	– 59	– 50	– 59	9	7	5	7	5	7	5		
150	**180**	– 50	– 60	– 50	– 60	10	8	5	8	5	8	5		
180	**250**	– 50	– 61	– 50	– 61	11	8	6	10	7	10	7		
250	**315**	– 60	– 73	– 60	– 73	13	10	7	11	8	10	7		
315	**400**	– 60	– 80	– 60	– 80	15	11	8	13	10	13	8		

Tolerances for double-direction angular contact thrust ball bearings (Class 7 [2]) of TAC2xD type)

Table 7.16 Tolerances of inner ring, outer ring, and bearing height

Unit: μm

Nominal Bore Diameter d (mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Deviation of the Actual Bearing Height Δ_{Ts}		Radial Runout of Assembled Bearing Inner Ring (Outer Ring) K_{ia} (K_{ea})	Inner Ring Runout with Bore S_d	Inner ring (Outer Ring) Face Runout with Raceway S_{ia} (S_{ea})
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.
–	**30**	0	– 5	0	– 300	5	4	3
30	**50**	0	– 5	0	– 400	5	4	3
50	**80**	0	– 8	0	– 500	6	5	5
80	**120**	0	– 8	0	– 600	6	5	5
120	**180**	0	– 10	0	– 700	8	8	5
180	**250**	0	– 13	0	– 800	8	8	6
250	**315**	0	– 15	0	– 900	10	10	6
315	**400**	0	– 18	0	– 1 200	10	12	7

Table 7.17 Tolerance of outer ring

Unit: μm

Nominal Outside Diameter D (mm)		Deviation of Single Outside Dia. Δ_{Ds}	
Over	Incl.	High	Low
30	**50**	– 25	– 41
50	**80**	– 30	– 49
80	**120**	– 36	– 58
120	**180**	– 43	– 68
180	**250**	– 50	– 79
250	**315**	– 56	– 88
315	**400**	– 62	– 98
400	**500**	– 68	– 108
500	**630**	– 76	– 120

Tolerances for Angular Contact Thrust Ball Bearings for Ball Screw Support

Tolerances for high-rigidity angular contact thrust ball bearings (Class PN7C [3]) of TACxxC type)

Table 7.18 TAC C Series

Unit: μm

Nominal Bore (Outer Ring) Diameter (mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Deviation of Single Bore Diameter Δ_{ds}		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Deviation of Single Outside Diameter Δ_{Ds}		Deviation of Single Inner Ring Width Δ_{Bs}		Inner ring (Outer Ring) Face Runout with Raceway S_{ia} (S_{ea})
Over	Incl.	High	Low	High	Low	High	Low	High	Low	High	Low	Max.
10	18	0	– 4	0	– 4	–	–	–	–	0	– 120	2.5
18	30	0	– 5	0	– 5	–	–	–	–	0	– 120	2.5
30	50	0	– 6	0	– 6	0	– 6	0	– 6	0	– 120	2.5
50	80	0	– 7	0	– 7	0	– 7	0	– 7	0	– 150	2.5
80	120	0	– 8	0	– 8	0	– 8	0	– 8	0	– 200	2.5

Tolerances for angular contact thrust ball bearings for high-load drive applications (Class PN5D [4]) of TAC0xD and TACxx-3 types)

Table 7.19 TAC03 Series

Unit: μm

Nominal Bore (Outer Ring) Diameter (mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Deviation of Single Inner Ring Width Δ_{Bs}		Inner ring (Outer Ring) Face Runout with Raceway S_{ia} (S_{ea})
Over	Incl.	High	Low	High	Low	High	Low	Max.
10	18	0	– 5	–	–	0	– 80	5
18	30	0	– 6	–	–	0	– 120	5
30	50	0	– 8	0	– 7	0	– 120	5
50	80	0	– 9	0	– 9	0	– 150	8
80	120	0	– 10	0	– 10	0	– 200	8
120	150	0	– 13	0	– 11	0	– 250	10
150	180	0	– 13	0	– 13	0	– 250	10
180	250	–	–	0	– 15	–	–	10
250	315	–	–	0	– 18	–	–	11
315	400	–	–	0	– 20	–	–	13

Tolerances for BSBD Series double-row bearings (Class P2B [5]) of BSF and BSN types)

Table 7.20 BSBD Series double-row bearings (BSF and BSN types)

Unit: μm

Nominal Bore Diameter (mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Inner Ring Face Runout with Raceway S_{ia}	Radial Runout of Inner Ring K_{ia}	Width Tolerance	
Over	Incl.	High	Low	High	Low	Max.	Max.	High	Low
10	18	0	– 5	0	– 10	1.5	1.5	0	– 250
18	30	0	– 5	0	– 10	2.5	2.5	0	– 250
30	50	0	– 5	0	– 10	2.5	2.5	0	– 250
50	80	0	– 8	0	– 15	2.5	2.5	0	– 250

7. Bearing Tolerances

Tolerances for Metric Design Tapered Roller Bearings

Inner Ring

Table 7.21 Inner ring (Class 5) Unit: μm

Nominal Bore Diameter d(mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Bore Diameter Variation in a Single Radial Plane V_{dp}	Mean Bore Diameter Variation V_{dmp}	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d
Over	Incl.	High	Low	Max.	Max.	Max.	Max.
10	18	0	− 7	5	5	3.5	7
18	30	0	− 8	6	5	4	8
30	50	0	− 10	8	5	5	8
50	80	0	− 12	9	6	5	8
80	120	0	− 15	11	8	6	9
120	180	0	− 18	14	9	8	10
180	250	0	− 22	17	11	10	11
250	315	0	− 25	—	—	13	13
315	400	0	− 30	—	—	15	15
400	500	0	− 35	—	—	18	19

Table 7.22 Inner ring (Class 4) Unit: μm

Nominal Bore Diameter d(mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Deviation of Single Bore Diameter Δ_{ds}		Bore Diameter Variation in a Single Radial Plane V_{dp}	Mean Bore Diameter Variation V_{dmp}	Radial Runout of Inner Ring K_{ia}	Inner Ring Runout with Bore S_d	Inner Ring Face Runout with Raceway S_{ia}
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.
10	18	0	− 5	0	− 5	4	4	2.5	3	3
18	30	0	− 6	0	− 6	5	4	3	4	4
30	50	0	− 8	0	− 8	6	5	4	4	4
50	80	0	− 9	0	− 9	7	5	4	5	4
80	120	0	− 10	0	− 10	8	5	5	5	5
120	180	0	− 13	0	− 13	10	7	6	6	7
180	250	0	− 15	0	− 15	11	8	8	7	8
250	315	0	− 18	0	− 18	—	—	10	8	10
315	400	0	− 23	0	− 23	—	—	12	10	14
400	500	0	− 27	0	− 27	—	—	14	13	17

Remarks: 1. The outside diameter "no-go side" tolerances (low) specified in this table do not necessarily apply within a distance of 1.2 times the chamfer dimension r (max.) from the ring face.

Outer Ring

Table 7.23 Outer ring (Class 5) Unit: μm

Nominal Outside Diameter D(mm)		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Outside Diameter Variation in a Single Radial Plane V_{Dp}	Mean Outside Diameter Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D
Over	Incl.	High	Low	Max.	Max.	Max.	Max.
18	30	0	− 8	6	5	6	8
30	50	0	− 9	7	5	7	8
50	80	0	− 11	8	6	8	8
80	120	0	− 13	10	7	10	9
120	150	0	− 15	11	8	11	10
150	180	0	− 18	14	9	13	10
180	250	0	− 20	15	10	15	11
250	315	0	− 25	19	13	18	13
315	400	0	− 28	22	14	20	13
400	500	0	− 33	—	—	23	15
500	630	0	− 38	—	—	25	18

Table 7.24 Outer ring (Class 4) Unit: μm

Nominal Outside Diameter D(mm)		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Deviation of Single Outside Diameter Δ_{Ds}		Outside Diameter Variation in a Single Radial Plane V_{Dp}	Mean Outside Diameter Variation V_{Dmp}	Radial Runout of Outer Ring K_{ea}	Variation of Outside Surface Generatrix Inclination with Face S_D	Outer Ring Face Runout with Raceway S_{ea}
Over	Incl.	High	Low	High	Low	Max.	Max.	Max.	Max.	Max.
18	30	0	− 6	0	− 6	5	4	4	4	5
30	50	0	− 7	0	− 7	5	5	5	4	5
50	80	0	− 9	0	− 9	7	5	5	4	5
80	120	0	− 10	0	− 10	8	5	6	5	6
120	150	0	− 11	0	− 11	8	6	7	5	7
150	180	0	− 13	0	− 13	10	7	8	5	8
180	250	0	− 15	0	− 15	11	8	10	7	10
250	315	0	− 18	0	− 18	14	9	11	8	10
315	400	0	− 20	0	− 20	15	10	13	10	13
400	500	0	− 23	0	− 23	—	—	15	11	15
500	630	0	− 28	0	− 28	—	—	18	13	18

Remarks: 1. The cylindrical bore diameter "no-go side" tolerance limit (high) specified in this table does not necessarily apply within a distance of 1.2 times the chamfer dimension r (max.) from the ring face.

MONTON

Tolerances for Thrust Ball Bearings

Shaft Washer

Table 7.25 Shaft washer (Class 5) Unit: μm

Nominal Bore Diameter d(mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Bore Diameter Variation in a Single Radial Plane V_{dp}	Shaft Washer (Housing Washer) Raceway to Back Face Thickness Variation S_i (S_e)	(Reference) Deviation of Bearing Height ΔT_s	
Over	Incl.	High	Low	Max.	Max.	High	Low
18	30	0	− 10	8	3	0	− 75
30	50	0	− 12	9	3	0	− 100
50	80	0	− 15	11	4	0	− 125
80	120	0	− 20	15	4	0	− 150
120	180	0	− 25	19	5	0	− 175
180	250	0	− 30	23	5	0	− 200
250	315	0	− 35	26	7	0	− 225
315	400	0	− 40	30	7	0	− 300
400	500	0	− 45	34	9	0	− 350
500	630	0	− 50	38	11	0	− 450
630	800	0	− 75	—	13	0	− 550
800	1000	0	− 100	—	15	0	− 700
1000	1250	0	− 125	—	18	0	− 900

Table 7.26 Shaft washer (Class 4) Unit: μm

Nominal Bore Diameter d(mm)		Single Plane Mean Bore Diameter Deviation Δ_{dmp}		Bore Diameter Variation in a Single Radial Plane V_{dp}	Shaft Washer (Housing Washer)Raceway to Back Face Thickness Variation S_i (S_e)	(Reference) Deviation of Bearing Height ΔT_s	
Over	Incl.	High	Low	Max.	Max.	High	Low
18	30	0	− 8	6	2	0	− 75
30	50	0	− 10	8	2	0	− 100
50	80	0	− 12	9	3	0	− 125
80	120	0	− 15	11	3	0	− 150
120	180	0	− 18	14	4	0	− 175
180	250	0	− 22	17	4	0	− 200
250	315	0	− 25	19	5	0	− 225
315	400	0	− 30	23	5	0	− 300
400	500	0	− 35	26	6	0	− 350
500	630	0	− 40	30	7	0	− 450
630	800	0	− 50	—	8	0	− 550

Housing Washer

Table 7.27 Housing washer (Class 5) Unit: μm

Nominal Outside Diameter D(mm)		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Outside Diameter Variation in a Single Radial Plane V_{Dp}
Over	Incl.	High	Low	Max.
30	50	0	− 16	12
50	80	0	− 19	14
80	120	0	− 22	17
120	180	0	− 25	19
180	250	0	− 30	23
250	315	0	− 35	26
315	400	0	− 40	30
400	500	0	− 45	34
500	630	0	− 50	38
630	800	0	− 75	55
800	1000	0	− 100	75
1000	1250	0	− 120	—
1250	1600	0	− 160	—

Table 7.28 Housing washer (Class 4) Unit: μm

Nominal Outside Diameter D(mm)		Single Plane Mean Outside Diameter Deviation Δ_{Dmp}		Outside Diameter Variation in a Single Radial Plane V_{Dp}
Over	Incl.	High	Low	Max.
30	50	0	− 9	7
50	80	0	− 11	8
80	120	0	− 13	10
120	180	0	− 15	11
180	250	0	− 20	15
250	315	0	− 25	19
315	400	0	− 28	21
400	500	0	− 33	25
500	630	0	− 38	29
630	800	0	− 45	34

8. Design of Shafts and Housings

Fitting of Shafts and Housings

In order to take full advantage of the capabilities of super precision bearings such as running accuracy, high-speed performance, and low heat generation, a high level of accuracy is required of shafts, housings and other surrounding parts as well.

When the inner ring or outer ring is mounted onto a shaft or into a housing with interference, the shape of the shaft or the housing (out-of-roundness) is transferred to the bearing raceway surfaces and will affect running accuracy. When multiple angular contact ball bearings are used in combination, cylindricity affects the distribution of preload between the bearings. Therefore, the parts that mate with bearing surfaces should be as accurate as possible. Inaccurate mating of parts may cause the formation of peaks or ridges along the shaft, which can affect the quality of finished work, especially in precision lathes etc.

Tables 8.1 through 8.4 list recommended interference values for bearings operated in standard conditions at speeds of less than 800 000 $d_m n$ (Tables 8.1 and 8.2 refer to bearings for machine tool spindles, Tables 8.3 and 8.4 refer to ball screw support bearings).

For thrust cylindrical roller bearings and thrust ball bearings, we recommend a shaft fit of h6 and a housing fit of G7 as a target. Clearance fits are commonly used for both shaft washer and housing washer. However, particularly in the case of thrust ball bearings where alignment of both washers with the shaft is required, small values are preferable within the range that assembly allows.

Table 8.1 Fits on Shafts

Bearing type	Shaft Outer diameter (mm)		Tolerance of shaft outer diameter (mm)		Target interference(1)(2) (mm)	
	Over	Incl.	Min.	Max.	Min.	Max.
Bearings for machine tool spindles	**10**	**18**	− 0.003	0	0	0.002T
	18	**50**	− 0.004	0	0	0.003T
	50	**80**	− 0.005	0	0	0.003T
	80	**120**	− 0.003	0.003	0	0.004T
	120	**180**	− 0.004	0.004	0	0.006T
	180	**250**	− 0.005	0.005	0	0.008T
	250	**315**	− 0.008	0.008	0	0.010T
	315	**400**	− 0.009	0.009	0	0.013T
	400	**500**	− 0.010	0.010	0	0.015T

(1) Use the target interference when the bearing can be matched to the shaft or housing. Otherwise, use the shaft outer diameter and housing bore minimum and maximum for random matching.
(2) T=Interference or tight fit; L=Clearance or loose fit
(3) Only applicable if outer ring is inserted into housing separately.

Table 8.2 Fits on Housings

Bearing type	Housing Bore diameter (mm)		Tolerance of housing bore (mm)		Target interference (1)(2) (mm)	
	Over	Incl.	Min.	Max.	Min.	Max.
Angular contact ball bearings (Fixed end)	**18**	**50**	− 0.002	0.002	0.002L	0.005L
	50	**80**	− 0.0025	0.0025	0.002L	0.005L
	80	**120**	− 0.003	0.003	0.002L	0.006L
	120	**180**	− 0.004	0.004	0.003L	0.009L
	180	**250**	− 0.005	0.005	0.004L	0.012L
	250	**315**	− 0.006	0.006	0.005L	0.015L
	315	**400**	− 0.007	0.007	0.007L	0.02L
	400	**500**	− 0.008	0.008	0.008L	0.023L
	500	**630**	− 0.008	0.008	0.008L	0.024L
	630	**800**	− 0.009	0.009	0.009L	0.027L
Angular contact thrust ball bearings (if used together with radial bearings)	**50**	**80**	− 0.005	0	0.025L	0.037L
	80	**120**	− 0.007	0	0.033L	0.047L
	120	**150**	− 0.008	0	0.042L	0.059L
	150	**180**	− 0.011	0	0.039L	0.059L
	180	**250**	− 0.012	0	0.038L	0.061L
	250	**315**	− 0.013	0	0.047L	0.073L
	315	**400**	− 0.015	0	0.045L	0.080L
	400	**500**	− 0.016	0	0.054L	0.091L
	500	**630**	− 0.018	0	0.052L	0.094L
Angular contact ball bearings (Free end)	**18**	**50**	0.004	0.007	0.006L	0.009L
	50	**80**	0.005	0.008	0.007L	0.01L
	80	**120**	0.006	0.010	0.008L	0.012L
	120	**180**	0.008	0.014	0.011L	0.017L
	180	**250**	0.010	0.018	0.014L	0.022L
	250	**315**	0.012	0.022	0.017L	0.027L
	315	**400**	0.013	0.026	0.021L	0.034L
	400	**500**	0.015	0.030	0.024L	0.039L
	500	**630**	0.016	0.032	0.026L	0.042L
	630	**800**	0.018	0.036	0.031L	0.049L
Cylindrical roller bearings, Tapered roller bearings (3)	**50**	**80**	− 0.005	0	0.002L	0.002T
	80	**120**	− 0.007	0	0.002L	0.002T
	120	**180**	− 0.008	0	0.003L	0.003T
	180	**250**	− 0.011	0	0.004L	0.004T
	250	**315**	− 0.012	0	0.005L	0.005T
	315	**400**	− 0.013	0	0.007L	0.007T
	400	**500**	− 0.015	0	0.008L	0.008T
	500	**630**	− 0.016	0	0.008L	0.008T
	630	**800**	− 0.018	0	0.009L	0.009T

8. Design of Shafts and Housings

Recommended interference values for standard operating conditions of ball screws are listed in Tables 8.3 and 8.4.

When using angular contact thrust ball bearings for high-load drive ball screw support, in cases where a single end is supported and moment loads are high, it is advisable to increase shaft interference, for example by choosing k5 etc. as required.

For super precision class applications please make sure during designing and mounting that:

Misalignment in inclination is below 1/2000 (target: below 1/5000)

Eccentricity is below 0.020mm

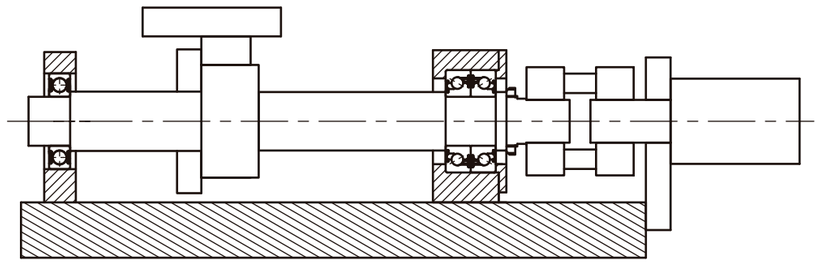
Table 8.3 Fits on Shafts

Bearing type	Shaft Outer Diameter (mm)		Tolerance of Shaft Outer Diameter (mm)		
	Over	Incl.		Min.	Max.
Angular contact thrust ball bearings for ball screw support in machine tools	**10**	**18**	h5	− 0.008	0
	18	**30**		− 0.009	0
	30	**50**		− 0.011	0
	50	**80**		− 0.013	0
	80	**120**		− 0.015	0
Angular contact thrust ball bearings for ball screw support in high-load drive applications	**10**	**18**	js5	− 0.004	0.004
	18	**30**		− 0.0045	0.0045
	30	**50**		− 0.0055	0.0055
	50	**80**		− 0.0065	0.0065
	80	**120**		− 0.0075	0.0075

Table 8.4 Fits on Housings

Bearing type	Housing Bore Diameter (mm)		Tolerance of Housing Bore Diameter (mm)		
	Over	Incl.		Min.	Max.
Angular contact thrust ball bearings for ball screw support	**30**	**50**	H6	0	0.016
	50	**80**		0	0.019
	80	**120**		0	0.022
	120	**180**		0	0.025
	180	**250**		0	0.029
	250	**315**		0	0.032

Fig. 8.1 Arrangement of Ball Screw Support Bearings (Example)



Recommended accuracy and surface roughness for bearing seats in machine tool spindle applications are shown in the tables below.

When using cylindrical roller bearings with tapered bores, if the taper of the inner ring does not match that of the shaft, misalignment of the inner ring groove will cause irregular movement of the rollers. With double-row cylindrical roller bearings, a difference in residual clearance between the rows will occur. Consequently, load will not be sustained equally, and rigidity will decline.

We recommend that you gauge the tapered parts to be mated with bearings. Contact should cover more than 80% of the total surface area that is dyed blue. Please refer to page 248 for a description and details on the gauging of shaft tapers.

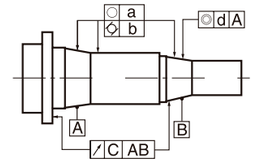


Table 8.5 Tolerance for and Mean Roughness of Shafts

Shaft Diameter (mm)		Tolerance Grades and Mean Roughness (μm)							
		Out-of-roundness (○)		Cylindricity (⌭)	Runout (↗)		Coaxiality (◎)		Roughness
		a		b	c		d		R_a
		Bearing Accuracy		Bearing Accuracy	Bearing Accuracy		Bearing Accuracy		Bearing Accuracy
Over	Incl.	P5	P4,P3,P2	All accuracy classes	P5	P4,P3,P2	P5	P4,P3,P2	All accuracy classes
—	**10**	0.7	0.5	0.7	2	1.2	4	2.5	0.2
10	**18**	1	0.6	1	2.5	1.5	5	3	0.2
18	**30**	1.2	0.7	1.2	3	2	6	4	0.2
30	**50**	1.2	0.7	1.2	3.5	2	7	4	0.2
50	**80**	1.5	1	1.5	4	2.5	8	5	0.2
80	**120**	2	1.2	2	5	3	10	6	0.4
120	**180**	2.5	1.7	2.5	6	4	12	8	0.4
180	**250**	3.5	2.2	3.5	7	5	14	10	0.4
250	**315**	4	3	4	8	6	16	12	0.4
315	**400**	4.5	3.5	4.5	9	6.5	18	13	0.8
400	**500**	5	4	5	10	7.5	20	15	0.8

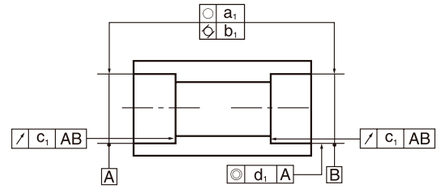


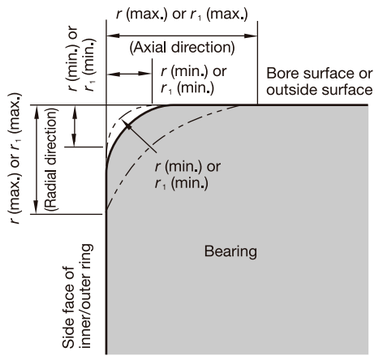
Table 8.6 Tolerance for and Mean Roughness of Housings

Housing Bore Diameter (mm)		Tolerance Grades and Mean Roughness (μm)							
		Out-of-roundness (○)		Cylindricity (⌭)	Runout (↗)		Coaxiality (◎)		Roughness
		a_1		b_1	c_1		d_1		R_a
		Bearing Accuracy		Bearing Accuracy	Bearing Accuracy		Bearing Accuracy		Bearing Accuracy
Over	Incl.	P5	P4,P3,P2	All accuracy classes	P5	P4,P3,P2	P5	P4,P3,P2	All accuracy classes
10	**18**	1	0.6	1	2.5	1.5	5	3	0.4
18	**30**	1.2	0.7	1.2	3	2	6	4	0.4
30	**50**	1.2	0.7	1.2	3.5	2	7	4	0.4
50	**80**	1.5	1	1.5	4	2.5	8	5	0.4
80	**120**	2	1.2	2	5	3	10	6	0.8
120	**180**	2.5	1.7	2.5	6	4	12	8	0.8
180	**250**	3.5	2.2	3.5	7	5	14	10	0.8
250	**315**	4	3	4	8	6	16	12	1.6
315	**400**	4.5	3.5	4.5	9	6.5	18	13	1.6
400	**500**	5	4	5	10	7.5	20	15	1.6
500	**630**	5.5	4.5	5.5	11	8	22	16	1.6
630	**800**	6.5	5	6.5	12.5	9	25	18	1.6

8. Design of Shafts and Housings

Chamfer Dimension Limits and Corner Radius of Shaft or Housing

Fig. 8.2 Chamfer Dimension



Remarks: The precise shape of chamfer surfaces has not been specified but its profile in the axial plane shall not intersect an arc of radius r (min.) or r_1 (min.) touching the side face of an inner ring and the bore surface, or the side face of an outer ring and the outside surface.

r : chamfer dimension of inner/outer ring
r_1: chamfer dimension of inner/outer ring (Front side)

Table 8.7 Chamfer Dimension Limits for Radial Bearings (excluding Tapered Roller Bearings)

Unit: mm

Smallest permissible chamfer dimension	Nominal bore diameter d		Largest permissible chamfer dimension		For reference
			r (max.) or r_1 (max.)		Corner radius of shaft or housing
r (min.) or r_1 (min.)	Over	Incl.	Radial direction	Axial direction (1)	r_a Max.
0.15	—	—	0.3	0.6	0.15
0.3	—	40	0.6	1	0.3
0.3	40	—	0.8	1	0.3
0.6	—	40	1	2	0.6
0.6	40	—	1.3	2	0.6
1	—	50	1.5	3	1
1	50	—	1.9	3	1
1.1	—	120	2	3.5	1
1.1	120	—	2.5	4	1
1.5	—	120	2.3	4	1.5
1.5	120	—	3	5	1.5
2	—	80	3	4.5	2
2	80	220	3.5	5	2
2	220	—	3.8	6	2
2.1	—	280	4	6.5	2
2.1	280	—	4.5	7	2
2.5	—	100	3.8	6	2
2.5	100	280	4.5	6	2
2.5	280	—	5	7	2
3	—	280	5	8	2.5
3	280	—	5.5	8	2.5
4	—	—	6.5	9	3
5	—	—	8	10	4
6	—	—	10	13	5

Table 8.8 Chamfer Dimension Limits for Tapered Roller Bearings

Unit: mm

Smallest permissible chamfer dimension	Nominal bore diameter or nominal outside diameter d or D		Largest permissible chamfer dimension r (max.)		For reference Corner radius of shaft or housing
r (min.)	Over	Incl.	Radial direction	Axial direction (1)	r_a Max.
0.6	—	40	1.1	1.7	0.6
0.6	40	—	1.3	2	0.6
1	—	50	1.6	2.5	1
1	50	—	1.9	3	1
1.5	—	120	2.3	3	1.5
1.5	120	250	2.8	3.5	1.5
1.5	250	—	3.5	4	1.5
2	—	120	2.8	4	2
2	120	250	3.5	4.5	2
2	250	—	4	5	2
2.5	—	120	3.5	5	2
2.5	120	250	4	5.5	2
2.5	250	—	4.5	6	2
3	—	120	4	5.5	2.5
3	120	250	4.5	6.5	2.5
3	250	400	5	7	2.5
3	400	—	5.5	7.5	2.5
4	—	120	5	7	3
4	120	250	5.5	7.5	3
4	250	400	6	8	3
4	400	—	6.5	8.5	3
5	—	180	6.5	8	4
5	180	—	7.5	9	4
6	—	180	7.5	10	5
6	180	—	9	11	5

(1) For inner ring chamfer, locate d in "Over"/"Incl." columns; for outer ring chamfer, locate D in "Over"/"Incl." columns.

Table 8.9 Chamfer Dimension Limits for Thrust Bearings

Unit: mm

Smallest permissible chamfer dimension	Largest permissible chamfer dimension r (max.)	For reference Corner radius of shaft or housing
r (min.) or r_1 (min.)	Radial and axial direction	r_a Max.
0.6	1.5	0.6
1	2.2	1
1.1	2.7	1
1.5	3.5	1.5
2	4	2
2.1	4.5	2
3	5.5	2.5
4	6.5	3
5	8	4
6	10	5
7.5	12.5	6
9.5	15	8
12	18	10
15	21	12
19	25	15

9. Spacers

Spacer Dimensions

The dimensions of standard spacers for open type angular contact ball bearings (19, 29, 10, 20 and 02 Series) are listed below.

Additional information:

Material of spacer: Bearing steel or carbon steel

When using spacers, parallelism of spacer end surfaces should be:

Less than 0.003 mm (for spacers up to 300mm bore size)

Less than 0.004 mm (for spacers over 300mm bore size)

19 or 29 Series

Standard spacers for dimension series 19 or 29 (79, BNR19, BER19, BNR29, BER29, BSR19)

Unit: mm

Bore number	Nominal bearing bore diameter d	Bearing outside diameter D	Outer ring spacer		Inner ring spacer		Spacer chamfer
			Outer diameter (1)	Bore	Outer diameter	Bore (2)	
00	10	22	21.5	17.5	14.5	10.5	0.2
01	12	24	23.5	19.5	16.5	12.5	0.2
02	15	28	27.5	23.5	19.5	15.5	0.2
03	17	30	29.5	25.5	21.5	17.5	0.2
04	20	37	36.5	31.5	26	20.5	0.2
05	25	42	41.5	36	31	25.5	0.2
06	30	47	46.5	41	36	30.5	0.2
07	35	55	54.5	48	42	35.5	0.3
08	40	62	61.5	54.5	47.5	40.5	0.3
09	45	68	67.5	60	53	45.5	0.3
10	50	72	71.5	66	56	50.5	0.3
11	55	80	79.5	72	64	55.5	0.5
12	60	85	84.5	77	68	60.5	0.5
13	65	90	89.5	82	73	65.5	0.5
14	70	100	99.5	91.5	79	70.5	0.5
15	75	105	104.5	96.5	84	75.5	0.5
16	80	110	109.5	101.5	89.5	80.5	0.5
17	85	120	119.5	110	95	85.5	0.5
18	90	125	124.2	116	100	90.5	0.5
19	95	130	129.2	120	106	95.5	0.5
20	100	140	139.2	129	112	100.5	0.5
21	105	145	144.2	133	117	105.5	0.5
22	110	150	149.2	138	122	110.5	0.5
24	120	165	164.2	152	133	120.5	0.5
26	130	180	179.2	166	144	130.8	0.8
28	140	190	189.2	176	154	140.8	0.8
30	150	210	209.2	193	167	150.8	1.0
32	160	220	219.2	203	175	160.8	1.0
34	170	230	229.2	214	188	170.8	1.0
36	180	250	249.2	231	200	180.8	1.0
38	190	260	259.2	242	206	190.8	1.0
40	200	280	279.2	255	225	200.8	1.0
44	220	300	299.2	275	245	220.8	1.2
48	240	320	319.2	297	263	240.8	1.2
52	260	360	359.2	322	290	260.8	1.2
56	280	380	379.2	348	312	280.8	1.2
60	300	420	419.2	386	335	300.8	1.2
64	320	440	439.2	400	360	320.8	1.2
68	340	460	459.2	425	375	340.8	1.2
72	360	480	479.2	441	399	360.8	1.2
76	380	520	519.2	475	425	380.8	1.5
80	400	540	539.2	494	446	400.8	1.5

(1) For outer ring spacers operated using oil mist lubrication or jet lubrication, we recommend that the outer diameter of the outer ring spacer is the same as the bearing outside diameter, with a tolerance of g5 or better.

(2) For high-speed operations exceeding 700 000 $d_m n$, we recommend that the bore diameter of the inner ring spacer is the same as the bearing bore diameter, with a tolerance of F6 or better.

9. Spacers

Additional information:

Material of spacer: Bearing steel or carbon steel

When using spacers, parallelism of spacer end surfaces should be:

Less than 0.003 mm (for spacers up to 300mm bore size)

Less than 0.004 mm (for spacers over 300mm bore size)

10 or 20 Series

Standard spacers for dimension series 10 or 20 (70, BNR10, BER10, BNR20, BER20, BSR10)

Unit: mm

Bore number	Nominal bearing bore diameter *d*	Bearing outside diameter *D*	Outer ring spacer		Inner ring spacer		Spacer chamfer
			Outer diameter (1)	Bore	Outer diameter	Bore (2)	
00	10	26	25.5	21.5	14.5	10.5	0.2
01	12	28	27.5	23.5	17	12.5	0.2
02	15	32	31.5	27	20	15.5	0.2
03	17	35	34.5	29.5	23	17.5	0.2
04	20	42	41.5	35	27	20.5	0.3
05	25	47	46.5	40.5	32	25.5	0.3
06	30	55	54.5	47.5	38	30.5	0.5
07	35	62	61.5	54	43	35.5	0.5
08	40	68	67.5	60	48	40.5	0.5
09	45	75	74.5	66	55	45.5	0.5
10	50	80	79.5	71	60	50.5	0.5
11	55	90	89.5	81	66	55.5	0.5
12	60	95	94.5	86	69	60.5	0.5
13	65	100	99.5	91	74	65.5	0.5
14	70	110	109.5	98	83	70.5	0.5
15	75	115	114.5	105	85	75.5	0.5
16	80	125	124.2	112	93	80.5	0.5
17	85	130	129.2	117	99	85.5	0.5
18	90	140	139.2	126	104	90.5	0.8
19	95	145	144.2	131	109	95.5	0.8
20	100	150	149.2	136	114	100.5	0.8
21	105	160	159.2	144	121	105.5	1.0
22	110	170	169.2	153	128	110.5	1.0
24	120	180	179.2	166	136	120.5	1.0
26	130	200	199.2	177	150	130.8	1.0
28	140	210	209.2	190	160	140.8	1.0
30	150	225	224.2	203	172	150.8	1.2
32	160	240	239.2	217	183	160.8	1.2
34	170	260	259.2	230.5	199.5	170.8	1.2
36	180	280	279.2	250	210	180.8	1.2
38	190	290	289.2	261	221	190.8	1.2
40	200	310	309.2	278	232	200.8	1.2
44	220	340	339.2	305	255	220.8	1.2
48	240	360	359.2	325	275	240.8	1.2
52	260	400	399.2	345	304	260.8	1.5
56	280	420	419.2	380	320	280.8	1.5
60	300	460	459.2	412	352	300.8	1.5
64	320	480	479.2	440	360	320.8	1.5
68	340	520	519.2	470	390	340.8	2.0
72	360	540	539.2	490	410	360.8	2.0
76	380	560	559.2	502	438	380.8	2.0
80	400	600	599.2	536	464	400.8	2.0

(1) For outer ring spacers operated using oil mist lubrication or jet lubrication, we recommend that the outer diameter of the outer ring spacer is the same as the bearing outside diameter, with a tolerance of g5 or better.

(2) For high-speed operations exceeding 700 000 $d_m n$, we recommend that the bore diameter of the inner ring spacer is the same as the bearing bore

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02 Series

Standard spacers for dimension series 02 (72, BSR02)

Unit: mm

Bore number	Nominal bearing bore diameter *d*	Bearing outside diameter *D*	Outer ring spacer		Inner ring spacer		Spacer chamfer
			Outer diameter (1)	Bore	Outer diameter	Bore (2)	
00	10	30	29.5	25	17	10.5	0.3
01	12	32	31.5	27	18	12.5	0.3
02	15	35	34.5	29	21	15.5	0.3
03	17	40	39.5	33	24	17.5	0.3
04	20	47	46.5	39	28	20.5	0.5
05	25	52	51.5	44	33	25.5	0.5
06	30	62	61.5	53	40	30.5	0.5
07	35	72	71.5	62	46	35.5	0.5
08	40	80	79.5	68	52	40.5	0.5
09	45	85	84.5	75	56	45.5	0.5
10	50	90	89.5	80	60	50.5	0.5
11	55	100	99.5	90	65	55.5	0.8
12	60	110	109.5	95	75	60.5	0.8
13	65	120	119.5	105	80	65.5	0.8
14	70	125	124.2	110	85	70.5	0.8
15	75	130	129.2	115	90	75.5	0.8
16	80	140	139.2	125	95	80.5	1.0
17	85	150	149.2	135	105	85.5	1.0
18	90	160	159.2	140	110	90.5	1.0
19	95	170	169.2	150	115	95.5	1.0
20	100	180	179.2	160	125	100.5	1.0
21	105	190	189.2	170	132	105.5	1.0
22	110	200	199.2	175	135	110.5	1.0
24	120	215	214.2	190	145	120.5	1.0
26	130	230	229.2	203	157	130.8	1.2
28	140	250	249.2	220	170	140.8	1.2
30	150	270	269.2	233	189	150.8	1.2
32	160	290	289.2	255	195	160.8	1.2
34	170	310	309.2	270	210	170.8	1.5
36	180	320	319.2	277	223	180.8	1.5
38	190	340	339.2	300	235	190.8	1.5
40	200	360	359.2	320	250	200.8	1.5

(1) For outer ring spacers operated using oil mist lubrication or jet lubrication, we recommend that the outer diameter of the outer ring spacer is the same as the bearing outside diameter, with a tolerance of g5 or better.

(2) For high-speed operations exceeding 700 000 $d_m n$, we recommend that the bore diameter of the inner ring spacer is the same as the bearing bore diameter, with a tolerance of F6 or better.

9. Spacers

Nozzle Position

The following table lists nozzle positions for oil-air, oil mist, and oil jet lubrication systems.

Unit: mm

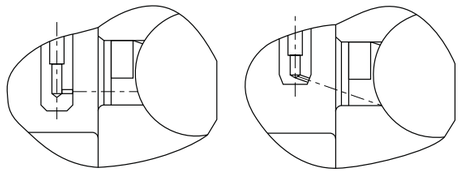
Bore number	Nominal bearing bore	79 Series		70 Series		72 Series		N10XXMR (Standard Series)		N10XXR (ROBUST Series)	
		ϕA (1)	*B*	*ϕA* (1)	*B*	*ϕA*	*B*	*ϕA*	*B*	*ϕA*	*B*
00	10	14.5	0.4	16.1	0.5	18.1	0.5	–	–	–	–
01	12	16.5	0.4	18.3	0.5	19.6	0.5	–	–	–	–
02	15	20.0	0.5	21.3	0.5	22.6	0.7	–	–	–	–
03	17	21.8	0.5	23.5	1.0	25.9	0.7	–	–	–	–
04	20	26.1	0.5	28.2	1.0	30.5	1.0	–	–	–	–
05	25	31.1	0.5	32.9	1.0	35.5	1.0	–	–	–	–
06	30	36.1	0.5	39.5	1.0	41.8	1.0	39.7	1.2	–	–
07	35	42.6	0.5	44.6	1.0	48.6	0.7	45.4	1.5	–	–
08	40	47.9	0.5	50.0	1.0	54.6	0.7	50.6	1.5	–	–
09	45	53.4	0.5	55.6	1.0	59.4	0.7	56.5	2.0	60.0	1.2
10	50	57.9	0.5	60.6	1.0	64.4	1.0	61.5	2.0	64.5	1.3
11	55	64.0	0.5	67.3	1.0	70.8	1.0	69.2	2.5	71.0	1.2
12	60	69.0	0.5	72.5	1.0	77.4	0.7	74.3	2.5	76.5	1.2
13	65	74.0	0.5	77.5	1.0	84.6	0.7	79.2	2.5	81.5	1.2
14	70	80.9	0.7	83.7	1.0	89.4	0.7	86.6	3.0	89.0	1.5
15	75	85.5	0.7	89.4	1.0	94.5	0.7	90.0	2.5	94.5	1.5
16	80	90.5	0.7	96.5	1.0	101.4	0.7	98.5	3.0	101.0	2.0
17	85	98.8	0.7	101.5	1.0	109.8	1.0	103.5	3.0	106.0	2.0
18	90	102.8	0.7	108.6	1.0	116.7	1.0	109.0	3.0	–	–
19	95	107.7	0.7	113.3	1.0	123.6	1.0	115.5	2.5	–	–
20	100	116.0	0.7	118.6	1.0	130.6	1.0	119.0	2.5	–	–
21	105	119.5	0.7	125.1	0.7	137.4	1.0	125.5	3.0	–	–
22	110	124.5	0.7	131.9	0.7	144.4	1.0	134.0	3.0	–	–
24	120	136.3	0.7	142.3	0.7	156.3	1.0	142.0	3.0	–	–
26	130	149.3	0.7	156.2	1.0	168.9	1.0	156.1	4.5	–	–
28	140	158.1	0.7	165.7	2.5	182.6	1.0	168.0	4.5	–	–
30	150	171.8	0.7	178.1	2.5	196.5	1	–	–	–	–
32	160	181.8	0.7	190.4	2.5	210	1	190	5	–	–
34	170	191.8	0.7	203.4	2.5	223	1	203	5	–	–
36	180	205.6	0.7	217.1	2.5	233	1	–	–	–	–
38	190	215.4	0.7	227.1	2.5	248	1	–	–	–	–
40	200	229	0.7	240.9	2.5	262	1	242	6.5	–	–
44	220	249	0.7	264.3	5	290	1.5	–	–	–	–
48	240	271.4	0.7	287	5	320	2	–	–	–	–

(1) *ϕ*A of 79 and 70 Series bearings are in compliance with DIN Standard 628-6.

Note

- Positioning the nozzle parallel to the spindle axis is sufficient for normal operating speeds. For bearings usually operated at high speeds, it is advantageous to position the nozzle bore so that the lubricant is directed into the bearing at an angle of about 15° to 20°.
- An appropriate oil drain is necessary to prevent oil from accumulating in the spindle which leads to increased heat in the sliding sections and damages bearings.
- We recommend filtering the oil to 5 micron or less before it enters the lubrication system. Refer to page 220 for an example of an oil-air lubrication system.

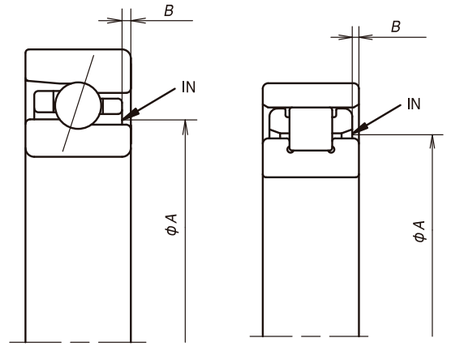
Fig. 9.1 Angle of Spray Nozzle



Unit: mm

Nominal bearing bore	BNR19 BER19		BNR10 BER10		BSR19		BSR10		BSR02		BAR10 BTR10	
	ϕA	*B*	*ϕA*	*B*	*ϕA*	*B*	*ϕA*	*B*	*ϕA*	*B*	*ϕA*	*B*
6	–	–	–	–	–	–	9.0	0.4	–	–	–	–
7	–	–	–	–	–	–	10.5	0.4	–	–	–	–
8	–	–	–	–	–	–	12.0	0.5	–	–	–	–
10	–	–	–	–	13.5	0.4	14.5	0.5	17.0	1.0	–	–
12	–	–	–	–	15.5	0.4	16.5	0.5	18.0	0.5	–	–
15	–	–	–	–	18.5	0.5	20.0	1.0	21.0	1.0	–	–
17	–	–	–	–	20.5	0.5	22.5	1.5	24.0	0.5	–	–
20	–	–	–	–	25.0	0.8	26.5	0.8	28.3	0.5	–	–
25	31.0	0.5	–	–	30.0	0.8	31.5	0.8	33.2	1.0	–	–
30	35.5	0.5	39.0	1.0	–	–	–	–	–	–	–	–
35	42.0	0.5	44.5	1.2	–	–	–	–	–	–	–	–
40	48.0	0.5	50.0	1.5	–	–	–	–	–	–	–	–
45	53.0	0.5	55.5	1.7	–	–	–	–	–	–	–	–
50	57.5	0.5	60.5	1.7	–	–	–	–	–	–	60.5	0.9
55	63.5	0.5	67.5	1.5	–	–	–	–	–	–	67.5	0.7
60	68.5	0.5	73.0	1.5	–	–	–	–	–	–	73.5	0.7
65	73.5	0.5	77.5	1.5	–	–	–	–	–	–	77.5	0.7
70	80.5	0.7	84.0	1.7	–	–	–	–	–	–	84.0	0.7
75	85.0	0.7	89.0	1.7	–	–	–	–	–	–	89.0	0.7
80	90.5	0.7	96.0	1.7	–	–	–	–	–	–	96.0	0.9
85	98.5	0.7	102.0	1.7	–	–	–	–	–	–	102.0	0.9
90	102.0	0.7	109.0	1.7	–	–	–	–	–	–	108.5	1.2
95	107.0	0.7	112.0	1.7	–	–	–	–	–	–	112.5	1.2
100	113.5	0.7	118.5	2.5	–	–	–	–	–	–	118.5	1.7
105	119.0	0.7	125.0	1.7	–	–	–	–	–	–	126.0	1.4
110	124.0	0.7	132.5	1.7	–	–	–	–	–	–	132.5	1.2
120	136.0	0.7	143.0	1.7	–	–	–	–	–	–	142.5	1.2
130	149.0	0.7	156.5	1.7	–	–	–	–	–	–	155.5	1.7
140	157.5	0.7	166.0	1.7	–	–	–	–	–	–	167	1.7
150	171.5	0.7	178.5	1.7	–	–	–	–	–	–	179.5	1.9
160	181.8	0.7	190	2	–	–	–	–	–	–	190	2.0
170	191.8	0.7	–	–	–	–	–	–	–	–	205	1.7
180	205.6	0.7	–	–	–	–	–	–	–	–	218	2.0
190	215.4	0.7	–	–	–	–	–	–	–	–	228	2.0
200	229	0.7	–	–	–	–	–	–	–	–	242	2.2

Fig. 9.2 Position and Direction of Spray Nozzle



APPENDICES

Request for Specification Investigation

To request specification investigation, please contact the nearest **MONTON** office and provide us with the following information:

Request for a specification investigation regarding precision bearings

Name of company _____

- Operating conditions

Type of machine [Machining Center, Lathe, Internal Grinding Machine, Motor, Others ( )]

Model number _____

Position of bearing [Main shaft spindle, Ball screw support] [Fixed-end, Free-end]

Main shaft position [Vertical, Horizontal, Other ( )]

Bearing type — Please circle all that apply.

- Angular contact ball bearing [ ]
- Cylindrical roller bearing [ ]
- Angular contact thrust ball bearing [ ]
- Deep groove ball bearing [ ]
- Ball screw support bearing [ ]

Arrangement [DB · DBD · DBB · DF · DFD · DFF · Other ( )]

MONTON bearing number _____

Other maker number _____

Bore	mm	Outer diameter	mm	Overall wide	mm
Outer ring width	mm	Inner ring width	mm	Accuracy class	class
Clearance					

- Load condition

Rotating speed	min^{-1}	Radial load	N	Axial load	N
Moment	N·mm	Unclamp force	N		

- Shaft and housing

Tolerance of shaft		Tolerance of housing		Outer diameter of housing	mm
Material of shaft		Material of housing		Bore diameter of hollow shaft	mm
Driving method		Cooling method	(External cylinder cooling: Yes, No)	Preload type	(Position preload or constant pressure preload)
Spacer length	mm	Ambient temperature	°C		

- Requirement value

Rigidity	N/μm	Preload	N	Life	h

- Comments

Please indicate any special requests, questions, or comments here:

Attachments: (Yes) (No)