

Introduction

Sapporo Precision group has been fostering “EZO” brand for long years since its establishment. Fortunately, “EZO”, which was derived from the ancient name of Hokkaido Island, “EZO-CHI”, has achieved a remarkable growth and is enjoying profound trust from a number of domestic and foreign users in 28 different countries throughout the world. In the meantime, our production sites have spread out to overseas and a most-advanced and automated production facility has started operation in 2003 in Shanghai China. Having expanded from “Made in Hokkaido” to the global-scale supply system, we have decided to introduce a new brand “**SPB**”, subsequent to “EZO”.

“**SPB**” is the combination of two names, “**SAPPORO PRECISION BEARING**” and “**SHANGHAI PRECISION BEARING**”, which also implies our pride of “**SUPER PRECISION BEARING**”.

We will continue to produce “EZO” branded products in Japan for the time being but will integrate “EZO” into the unitary brand “**SPB**” at some point.

This new catalogue includes the recent revisions of JIS and ISO standards for ball bearings as well as the new bearing series we have introduced during recent years.

It consists of two parts: TECHNICAL EXPLANATION and DIMENSION TABLES.

The basic dynamic load ratings listed in the Bearing Tables are in accordance with JIS B 1518-1992 and ISO 281:1990.

The values reflect the effect of longer life due to improved manufacturing techniques and materials.

The basic static load ratings listed in the Bearing Tables are in accordance with JIS B 1519-1989.

In line with the revisions of JIS and ISO standards, governing the principal dimensions and precision of bearings, the chamfer dimensions have been changed to the minimum.

SAPPORO PRECISION INC. has a policy of complying with trade laws such as the Foreign Exchange Control, the Trading Administration and others that could prohibit the exports of products of a strategic nature. In case of doubt, in particular concerning super high precision bearings over ISO P2 quality, please check with us.

NOTE 1. All information, data and dimension tables in this catalogue have been compiled carefully and have been thoroughly checked. However, no responsibility for possible errors or omissions can be assumed.

NOTE 2. We reserve the right to change specifications and other information included in this catalogue without notice.

NOTE 3. Copyright reserved. If for certain reasons copying is required, prior approval by us should be obtained.

Bearing numbering system

RETAINER

STEEL RIBBON TYPE : J
 STEEL CROWN TYPE : W
 NYLON CROWN TYPE : TW
 STEEL RIVET TYPE : RJ
 FULL COMPLEMENT : V
 THRUST FM TYPE : TP(SUS304)
 THRUST F TYPE : TD(C3604)

MATERIAL

HIGH CARBON CHROMIUM STEEL
 SAE 52100, SUJ2, 100Cr6.....NO SYMBOL

STAINLESS STEEL
 AISI440C, SUS440C, X102CrMo17
 KS440(ACD34), X65Cr13

STANDARD METRICH
 MR, MF, MT AND INCH SERIES ..S

SEALS AND SHIELDS

TEFLON SEAL WITH SNAP RING : TTS
 STEEL SHIELD WITH SNAP RING : ZZS
 PRESSED STEEL SHIELD : ZZ
 CONTACT RUBBER SEAL : 2RS
 NON-CONTACT RUBBER SEAL : 2RU

RADIAL CLEARANCE

STANDARD : C2, C0(CN), C3, C4, C5
 MINIATURE : MC1 0~5 μm
 MC2 3~8 μm
 MC3 5~10 μm
 MC4 8~13 μm
 MC5 13~20 μm
 MC6 20~28 μm

Ex.1			686		J	ZZ	MC3		SRL
Ex.2		F	608		TW	2RS	MC4	P6	SRL
Ex.3		MR	52		W	ZZ	MC2	P5	AF2
Ex.4	S	MF	128		W	TTS	MC3	P6	SRL
Ex.5	S	ER	1458		W	ZZS	C0	A3	SRL
Ex.6			6205	H	RJ	2RS	C3		AV2
Ex.7		F	6706	H	W	2RU	C0		SRL
Ex.8	S	R	144		J	ZZS	MC4	A5P	AF2
Ex.9		R	10		RJ	ZZ	C2		AV2
Ex.10		F	3-8M	H	TP				AF2

BEARING TYPE

INCH: R
 INCH WITH FLANGE: FR
 INCH WITH EXTENDED INNER RING: RW
 INCH WITH EXTENDED INNER RING AND FLANGE: FRW
 METRIC STANDARD: NO SYMBOL
 METRIC WITH FLANGE: F
 SPECIAL METRIC: MR
 SPECIAL METRIC WITH FLANGE: MF

TOLERANCE CLASSES

ABEC1: NO SYMBOL
 ABEC3: A3
 ABEC5: A5
 ABEC7: A7
 ABEC5P: A5P
 ABEC7P: A7P
 ISO CLASS0: NO SYMBOL
 ISO CLASS6: P6
 ISO CLASS5: P5
 ISO CLASS4: P4

LUBRICATION

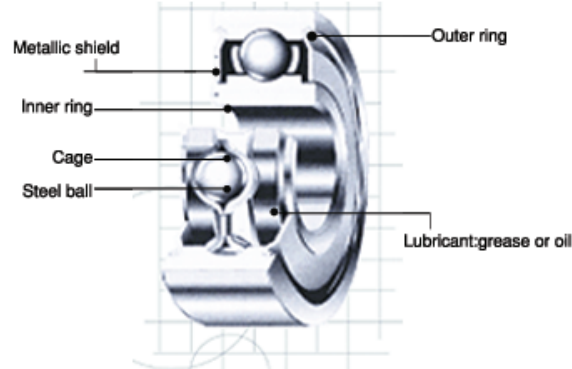
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 ALVANIA NO.2: AV2
 BEACON 325: B32
 RPM GREASE SRI2: SRI2
 MOLYKOTE 44M: M4M
 KRYTOX 240AC: K24
 ISOFLEX SUPER LDS18: SL8
 EX. OIL CODE
 AERO SHELL FLUID 12: AF2
 WINDSOR LUBE L-245X: WL2
 ANTIRUST P2100: 002

BEARING PART NO.



Design and characteristics of radial ball bearings

STRUCTURE OF BEARING



DESIGN OF BEARING

standard	extended inner ring	(V) full complement of balls	(N) with snap ring groove	(NR) with snap ring groove and snap ring	(F) with flanged outer ring
examples of special designs	examples of special designs	examples of special designs	examples of special designs	examples of special designs	examples of special designs

CHARACTERISTICS OF BEARINGS

LOAD	Single row radial ball bearings with balls separated by a cage can support radial loads, axial loads and tilting moments. A full complement V-type ball bearing can support only radial loads and some low axial loads.
SPEED	Maximum permissible speeds for ball bearings are mainly related to the bearing design and size, cage type, bearing internal clearance, method and type of lubrication, manufacturing accuracy, sealing methods and loads.
TORQUE AND NOISE LEVEL	Single row radial ball bearings are precision components and have low torque and noise levels.
INCLINATION OF INNER/OUTER RINGS	Shaft and housing seats with poor accuracy, fitting errors and shaft bending might cause inclination between the inner and outer rings although the internal clearance of the bearing will permit this to a certain extent. Generally, the maximum permissible inclination between the inner and outer rings is approximately 1 in 300.
TOUGHNESS	Bearings under load deform elastically at the contact point between the rolling element and bearing ring. This is influenced by the bearing type, size, form and load.
INSTALLATION AND REMOVAL	The single row radial ball bearing is a non-separable bearing. Therefore, shafts and housings should be so designed to enable bearing inspection and replacement when necessary.
AXIAL LOCATION	Improved axial location is obtained with NR and F type bearings.



Bearing material






Standard material for rings and balls is a vacuum degassed high carbon chromium steel allowing for high efficiency, low torque, low noise level and long bearing life. For bearings requiring anti-corrosion or heat-resistance properties, martensitic stainless steel is used.

CHEMICAL COMPOSITION OF BEARING MATERIALS

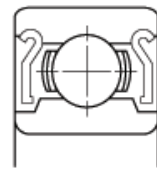
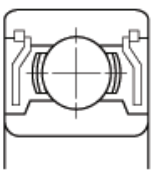
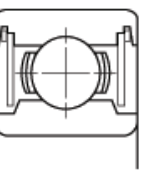
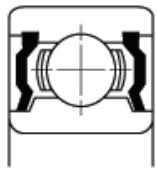
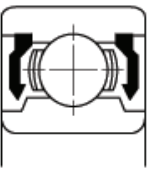
MATERIAL	SYMBOL	CHEMICAL COMPOSITION (Wt%)							EQUIVALENT	HARDNESS (HRC)
		C	Si	Mn	P	S	Cr	Mo		
HIGH CARBON CHROMIUM STEEL	SUJ2	0.95~1.10	0.15~0.35	≤0.50	≤0.025	≤0.025	1.30~1.60	≤0.08	SAE52100, 100Cr6, ASTM52100, BS535A99, 1.3505	60~64
STAINLESS STEEL	SUS440C	0.95~1.20	≤1.00	≤1.00	≤0.040	≤0.030	16.0~18.0	≤0.75	AISI440C, X102CrMo17, X105CrMo17, 1.4125, 1.3543	58~62
	KS440 (ACD34)	0.60~0.75	≤1.00	≤1.00	≤0.030	≤0.020	11.5~13.0	≤0.30	X65Cr13, 1.4037	58~62

Type and characteristics of cages, shields and seals

CAGES

				
W : ONE-PIECE STEEL CROWN TYPE	J : TWO-PIECES STEEL RIBBON TYPE	RJ : TWO-PIECES STEEL RIVET TYPE	TW : ONE-PIECE NYLON CROWN TYPE	V : FULL COMPLEMENT OF BALLS
The stainless steel pressed cage is inner ring guided. It shows excellent performance in low torque, low speed applications.	Consists of two mating steel pressings, the cover side and the finger side. Usually guided by the rolling elements and designed to reduce frictional torque.	The RJ type cage is suitable for larger bearings with a high load carrying capacity. The two pieces are riveted together and are strong enough to withstand higher levels of vibration and acceleration. The cage is guided by the balls and reduces frictional torque.	Moulded nylon cage. Reduces the fluctuation in running torque. Suitable for high speeds. Guided by the rolling elements. NYLON CAGE operating temperature range: from -30 to +120°C	This type of bearing has no cage but maximum possible number of balls. Due to the fact that the inner and outer ring have a filling slot, the axial load carrying capacity of this bearing type is low. This type of bearing is suitable for high radial load, low speed applications.

SHIELD , SEAL

				
ZZ : PRESSED STEEL SHIELD	ZS : STEEL SHIELD WITH SNAP RING	TTS : TEFLON SEAL WITH SNAP RING	2RS : CONTACT RUBBER SEAL	2RU : NON-CONTACT RUBBER SEAL
Non-contact shield pressed into outer ring. Very little grease leakage and low ingress of contaminants.	Non-contact shield retained in outer ring. Low ingress of contaminants. Mainly used for smaller or narrower bearings.	Teflon seal reinforced with glass fibre is retained in outer ring by snap ring. Low ingress of contaminants. Mainly used for smaller or narrower bearings. Seal can flex to accommodate internal pressure changes. TEFLON SEAL operating temperature range: from -100 to +260°C	Rubber seal fitted into outer ring. Light contact with inner ring, retains grease and prevents ingress of external contaminants. NBR SEAL operating temperature range: from -40 to +120°C FKM(VITON)SEAL operating temperature range: from -30 to +230°C	Non-contact rubber seal fitted into outer ring, still provides effective sealing. NBR SEAL operating temperature range: from -40 to +120°C FKM(VITON)SEAL operating temperature range: from -50 to +230°C