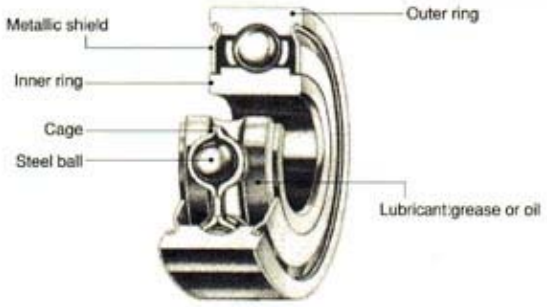
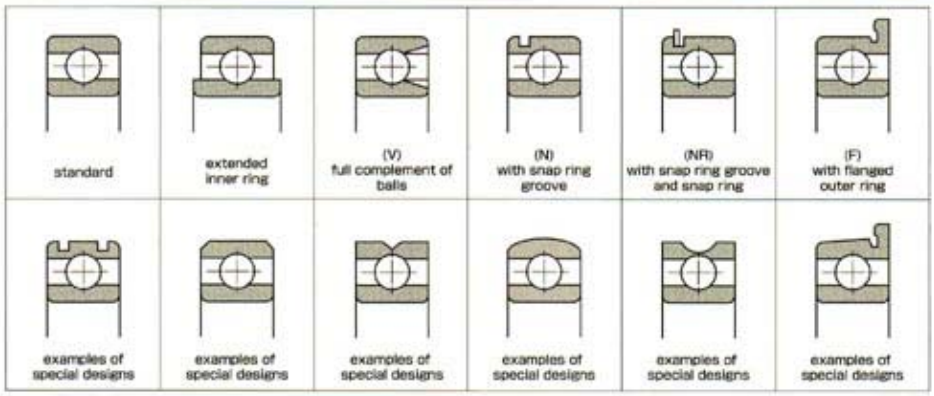
Design and characteristics of radial ball bearings

STRUCTURE OF BEARING



DESIGN OF BEARING



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 in 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 obtation 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

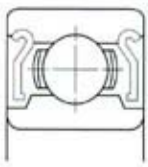
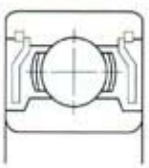
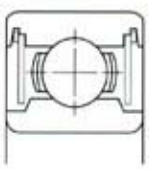
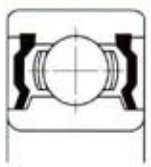
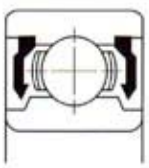
MATERIAL	SYMBOL	CHEMICAL COMPOSITION (Wt%)							EQUIVALENT	HARDNESS (HRC)
		C	Si	Mn	P	S	Cr	Mo		
HIGH CARBON CHROMIUM STEEL	SUJ2	0.95~1.10	0.15~0.35	≦0.50	≦0.025	≦0.025	1.30~1.60	≦0.08	SAE52100,100Cr6, ASTM52100, BS535A99,1.3505	60~64
STAINLESS STEEL	SUS440C	0.95~1.20	≦1.00	≦1.00	≦0.040	≦0.030	16.0~18.0	≦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℃	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	 ZZS : 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 intenal pressure changes. TEFLON SEAL operating temperature range:from -100 to +260℃	Rubber seal fitted into outer ring. Light contact with inner ring, retains grease and prevents ingress of extenal contaminants. NBR SEAL operating temperature range:from -40 to +120℃ FKM(VITON)SEAL operating temperature range:from -30 to +230℃	Non-contact rubber seal fitted into outer ring, still provides effective sealing. NBR SEAL operating temperature range:from -40 to +120℃ FKM(VITON)SEAL operating temperature range:from -50 to +230℃