

3.4 Heat resistant and cold resistant units (classification EN1 and EN2)

The ball bearing unit operating temperature range depends on the quality of the grease and on the quality of the oil seal rubber material used in the bearing. Normal operation emperature range for JIB ball bearing unit is from -20°C to 100°C. Heat resistant or cold resistant units should be used in high or low temperature environments outside the normal operating temperature range.

The unit is supplied with fluorine grease and seal in the equipments like a heat treatment facility and special surrounding, clean room, like PDP, semi-conductor, and so on. JIB manufactures the following standardized heat and cold resistant bearings shown in Table 3.1.

<TABLE 3.1> Heat resistant and cold resistant units

Classification	No.	Operating temperature range	Lubricating grease	Oil seal rubber material	Bearing clearance	
					UC	UK
Cold resistant	EN1	-30°C ~ +180°C	Super Lube(SYNCO)	Fluoric runbber	Normal	C3
Heat resistant	EN2	-30°C ~ +180°C	Super Lube(SYNCO)	Fluoric runbber	C4	C5
Chromium resistant	ENC2	-20°C ~ +280°C	Carbaflo 2371(FUCHS)	Fluoric runbber	C4	C5

4. Ball bearing unit materials

4.1 Bearing material

The bearing material for the orbital races and the rotating ball must meet the following requirements.

- 1) Strong against fatigue and repeated stress
- 2) High strength with high hardness number, elasticity, and yield point
- 3) Good internal wear resistance
- 4) High resistance against shock loads

5) Minimum change in dimension and shape due to aging
Typically in Japan and in other developed countries, high carbon chromium steel that exceeds the above requirements is used in bearings. Among the various high carbon chromium steels, the most widely used is the STB2 (SUJ2) which is also used by JIB in producing bearings.

<TABLE 4.1.1> Chemical composition of high carbon chromium bearing steel(KS D 3525)

Name	Chemical composition (%)								
	C	Si	Mn	P	S	Cr	Ni	Cu	Mo
STB2	0.95~1.10	0.15~0.35	Under 0.50	Under 0.025	Under 0.025	1.30~1.60	Under 0.25	Under 0.25	Under 0.08
STB3	0.95~1.10	0.40~0.70	0.090~1.15	Under 0.025	Under 0.025	0.90~1.20	Under 0.25	Under 0.25	Under 0.08

Remark : STB2 and STB3 are equivalent to JIS'S SUJ2 and SUJ3, respectively

4.2 Housing material

The housing material used is Class 3 (GC20) from KS D 4301.

Gray cast-iron steel is widely used for machine parts because the vibration absorbing capacity is greater than other metals.

<TABLE 4.2.1> Mechanical properties of gray cast-iron steel(KS D 4301)

Type	No.	Thickness (mm)	Diameter of testing bar(mm)	Tensile strength (Kg/mm)	Travers breaking test		hardness (HB)
					Maximum load(Kg)	Deflection(mm)	
Class3	GC200	over 4 ~ 8	13	over 24	over 200	over 2.0	under 255
		over 8 ~ 15	20	over 22	over 450	over 3.0	under 235
		over 15 ~ 30	30	over 20	over 900	over 4.5	under 223
		over 30 ~ 50	45	over 17	over 2,000	over 6.5	under 217

<TABLE 4.2.2> Chemical components of cold rolling steel plate(KS D 3512)

No.	Chemical composition (%)						
	C	Si	Mn	P	S	Ni	Cr
SPCC	Under 0.12	—	Under 0.50	Under 0.040	Under 0.045	—	—

<TABLE 4.2.3> Mechanical characteristic of zinc plated die casting
(KS D6005 = JIS H 5301 = ISO 301 = ASTM B 86)

Type	No.	Alloy	Tensile strength N/mm ²	Extension percentage %	Impact value N·m/cm ²	hardness HB(10 / 500)
class 2	ZDC 2	Zn-Al	285	10	140	82

<TABLE 4.2.4> Chemical characteristic of zinc plated die casting(%)

Type	No.	Al	Cu	Mg	Fe	Zn	Pb	Cd	Sn
class 2	ZDC 2	3.5 ~ 4.3	under 0.25	0.02 ~ 0.06	under 0.1	remainder	under 0.005	under 0.004	under 0.003

Remark : Corrosion is caused by impurities, so the sum should not exceed 0.01%.

4.3 Other components materials

The materials for rolling bearing components are listed in Table 4.3.

<TABLE 4.3> Parts material

Component	Material	No.	KS standard No.
Steel ball	High carbonized chrome bearing steel	SUJ2	KS D 3525
Retainer	Cold rolling steel plate	SPCC	KS D 3512
Seal(heat resistant)	Fluorine synthetic rubber	FKM	
Seal(regular)	Nitrile compound rubber	NBR	
Shield	Cold rolled carbon steel	SCPI-S	KS D 3512
Cast-iron cover	Gray cast-iron, Class 3	GC200	KS D 4301
Stamped steel cover	Cold rolled carbon steel	SPCC	KS D 3512
Hexagonal set screw	Chromium-molybdenum steel	SCM435	KS D 3711
Hexagonal spanner	Chromium-molybdenum steel	SCM435	KS D 3711
Grease nipple	Brass bar	C3604BE	KS D 5101
Eccentric self-locking collar	Machine use carbon steel	SM25C	KS D 3752
Sleeve adapter	Machine use carbon steel	SM25C	KS D 3752
Nut adapter	Machine use carbon steel	SM25C	KS D 3752
Adapter washer	Cold rolled carbon steel	SPCC	KS D 3512

5. Ball bearing unit accuracy

Ball bearing unit accuracy are based on KS B 2049 rolling bearing unit ball bearing and KS B 2050 rolling bearing unit bearing housing standards. JIB also follows the same accuracy standards for ball bearing production.

