STANDARD BEARING MATERIAL

The materials from which the bearing components are made determine to a large extent the performance and reliability of rolling bearings.

● For the bearing rings and rolling elements, typical considerations include hardness for load carrying capacity, fatigue resistance under rolling contact conditions, under clean or contaminated lubrication conditions, and the dimensional stability of the bearing components.
● For the cage, considerations include friction, strain, inertia forces, and in some cases, the chemical action of certain lubricants, solvents, coolants and refrigerants.
● Contact seals integrated in rolling bearings can also have a considerable impact on the performance and reliability of the bearings. The materials they are made of have to offer excellent oxidation, thermal or chemical resistance.

The relative importance of these considerations can be affected by other operational parameters such as corrosion, elevated temperatures, shock loads or combinations of these and other conditions.

All HCH bearings conform to RoHS and Reach Directive and have passed SGS testing which is further garanteed by HCH environment management system ISO 14001:2004, so you can use them with full confidence.

RoHS COMPLIANT 环保物料

REACH

ISO14001:2004

Rings & rolling elements

Because of high, repetitive stress to the rolling contact areas, fatigue phenomenon will occur to the bearing material after a duration of operation. Loading stress ultimately dislodges a surface section and the bearing fails. To delay the advent of material fatigue, bearing ring and rolling element materials should have the following properties:

● High level of hardness
● High rolling contact fatigue resistance
● Good wear resistance
● Dimensional stability
● Good mechanical strength

Today, carbon chromium steel is one of the oldest and most intensively investigated steels; due to the continuously increasing demands for extended bearing service life. The composition of this rolling bearing steel provides an optimum balance between manufacturing and application performance. This steel is normally given a martensitic or bainitic heat treatment during which it is hardened to the range of 58 to 65 HRC. Vacuum degassed, chromium-bearing steel GCr15 is the standard material for precision bearing rings and rolling elements. The material has uniform specification as SAE52100 (America), DIN100 Cr6 (German), JISSUJ2 (Japan).

Chemical composition of representative carbon chrome bearing steels

Steel No.	Chemical Composition %								
GCr 15 SAE52100 JISSUJ2 DIN 100 Gr6	C	Si	Mn	P	S	Cr	Mo	Cu	Ni
	0.95-1.05	0.15-0.35	0.25-0.45	≤0.02	≤0.015	1.4-1.6	0-0.08	0.06-0.02	≤0.2

Because HCH has the competence and facilities to provide a variety of materials, processes and coatings, HCH application engineers can assist in selecting those bearings that will provide superior performance for particular applications.

Cage material

Material for cages is required to have properties of good wear resistance, dimensional stability and good mechanical strength for perfect bearing running purpose. Therefore, for selection of cage material, it is important to consider the operation conditions.

● Sheet steel cages

These light weight cages have relatively high strength and can be surface treated to further reduce friction and wear. Cold-rolled steel is used for pressed cages.(Specification see the below table)

Sheet Steel No.	Chemical Composition %						
JISG 3141 SPCC	C	Si	Mn	P	S	Ni	Cr
	< 0.12	—	< 0.5	< 0.04	< 0.045	—	—

● Sheet brass cages

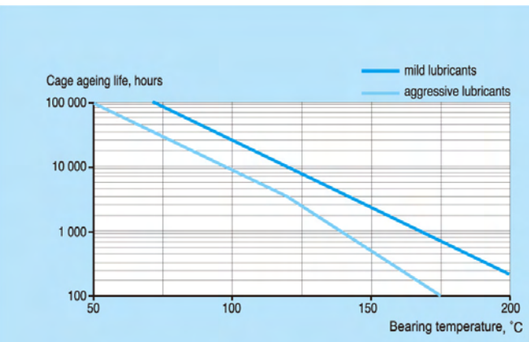
Pressed sheet brass cages are used for some small and medium-sized bearings. In applications such as compressors for refriger-action using ammonia, season cracking in sheet brass might occur, therefore steel cages should be used instead.

Standard	Symbols	Chemical Composition %								
		Cu	Zn	Mn	Fe	Al	Sn	Ni	Impurities	
									Pb	Si
JIS H 5120	CAC301 (HBsC 1)	55.0 - 60.0	33.0 - 42.0	0.1 - 1.5	0.5 - 1.5	0.5 -1.5	< 1.0	< 1.0	< 0.4	< 1.0
JIS H 3250	C 6782	56.0 - 60.5	Residual	0.1 - 1.5	0.5 -1.5	0.5 -1.5	—	—	< 0.5	—

● Polymer cages

Polyamide resin is applied depending on the type of bearing and the application, but should not be used at temperatures above 120 ℃ or below -40℃. For the majority of injection moulded cages, polyamide 6.6 is used. This material, with glass fibre reinforcement or without, is characterized by a favourable combination of strength and elasticity.

The mechanical properties like strength and elasticity of polymeric materials are temperature dependent and subject to permanent changes under operating conditions, called ageing. The most important factors that play a role in this ageing behaviour are temperature, time and the medium (lubricant) to which the polymer below. The relationship between these factors for glass fibre reinforced polyamide 6.6 is illustrated in diagram. It appears that the cage life decreases with increasing temperature and the aggressiveness of the lubricant.Therefore, whether polyamide cages are suitable for a specific application depends on the operating conditions and life requirements.



Cage ageing life for glass fibre reinforced polyamide 6.6

Notes: Please consult the HCH application engineering service for cage availability for specific bearing executions.

Shields & seals material

● Shields material

HCH bearings employ carbon steel as standard, and the option of AISI-300 stainless steel is available when needed.

● Seals material

HCH bearings use a variety of sealing materials to meet the requirements of high temperature operation and compatibility with greases. Buna Nitrile is the standard material used, while fluorocarbon, silicone, and teflon seals are commonly specified for high temperatures.

Type	ASTM D1418 Designation	Temperature Range	Hardness (Shore A)	Features	Limitation
Nitrile (Buna)	NBR	(-40~250F)	40~90	Low compression set, high tensile strength, and high abrasion resistance. Excellent resistance to petroleum-based oils and fuels.	Not recommended for very high temperature. Not recommended for exposure to sunlight and chemicals as acid, ether and esters.
Silicone	MQ/PMQ/ VMQ/PVMP	(-94~400F)	25~80	High temperature and dry heat resistance. High resistance to aging effects of both suglight and ozone attach.	Low abrasion and tear resistance. High friction characteristics.
Nitrile (Hydrogenated)	HNBR/NEM	(-30~330F)	50~90	The hydrogenation of Nirtrile, heat resistance, tensile strength. Enhanced physical strength and chemical resistance.	Not recommended for very low temperature. Not recommended for exposure to sunlight and chemicals as acid, ether and esters.
Fluororubber	FKM/FPM	(-20~400F)	50~95	Combining high temperature resistance with outstanding chemical resistance. Highly resistance to petroleum products,acids and silicone fluids.	Not recommended for situations requiring low temperature flexibility.
Polyacrylate	ACM Rubber	(0~350F)	40~90	Excellent resistance to hot oil, sunlight and ozone degradation. Also features an enhanced ability to resist flex cracking.	Water resistance is lower. Not recommended for very low temperature.

WARNING!

Safety precautions for fluoro rubber is very stable and harmless in normal operating conditions up to +200 ℃. However, if exposed to extreme temperatures above 300 ℃, e.g. fire or the flame of a cutting torch, fluoro rubber seals give off hazardous fumes. These fumes can be harmful if inhaled, as well as to the eyes. In addition, should not be in contact with the skin either.