For New Technology Network

NTN®

NTN corporation

Long-Life AS Series TAB/ETA Bearings

CAT. No. 3025／E

NTN Long-Life AS Series TAB/ETA Bearings

Our long-life TAB and ETA bearings are able to withstand harsh environments and load conditions.


TAB bearings


ETA bearings

Our TAB and ETA bearings were developed using new materials and a special heat treatment in order to satisfy the recent demand for longer life and more compact equipment. These bearings even last longer than the TMB (deep groove ball bearings) and ET (tapered roller bearings) bearings of our preceding long-life series. They offer excellent cost performance by enhancing equipment reliability. Don't take our word for it. See for yourself!

Applications

Ideal for applications that demand long life and compactness, such as automobile transmissions and differential pinions.

Advantages

Our TAB and ETA bearings offer better reliability, smaller size and lower cost. They also offer long life for lubrication containing hard foreign matter.

1 Features

- **Able to withstand lubrication containing hard foreign matter.**

  Automobile transmission bearings are often damaged by foreign matter in the lubrication. Our TAB/ETA bearings are designed to last longer under such conditions. Our TAB bearings last five times longer than the standard type, and twice as long as our TMB Series. Our ETA bearings last nine times as long as the standard, and five times longer than our ET Series.

- **Resists peeling.**

  Peeling damage is caused when lubrication conditions deteriorate during use. Our TAB/ETA bearings are designed to stretch life as long as possible by being more resistant to peeling. Our TAB bearings offer five times longer peeling life than the standard type, and our ETA bearings offer eight times longer peeling life.

2 Long-Life Mechanism

Because most bearing damage occurs on the raceway surface, **NTN** has enhanced the surface layer structure through a special heat treatment and selection of materials that have a persevering structure that does not give up surface hardness. Also, **NTN** has optimized the crowning of the tapered roller elements.

These measures inhibit formation of hairline cracks that serve as the starting point for peeling and various other types of damage, and provide merits such as long life.

2.1 Crack Resistance and Stress Relaxing Effect

Softer than martensite parent phase, *retained austenite* relaxes the stress concentration in the impression area caused by contaminated lubrication material inhibiting formation of cracks.

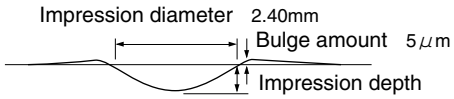
As shown in **Fig. 1**, residual stress shifts toward the pulling side for extreme surface layers of the impression portion in all cases, and through-hardened steel having undergone standard heat treatment produces residual tensile stress. If you compare items having special heat treatment and those having standard heat treatment, there is less harmful shift of stress to the pulling side for those having undergone special heat treatment. Special heat treatment is recognized as having a stress relaxing effect.

2.2 Reason for Long Life

For our ETA bearings, we use a moderate amount of dispersed carbides and retained austenite for the surface structure produced by the previously mentioned special heat treatment, and the structure is specially designed for thermal stability.

The raceway surface is usually affected by shear stress and heat generated by rolling, thus changing the material (residual stress, hardness, micro-structure) by tempering and fatigue, tending to produce fatigue cracks. Therefore, characteristics which prevent material from changing due to tempering (tempering resistance), and properties whereby material tends to stretch rather than crack (toughness) are effective for surface starting point type damage. Usually obtained by carbonizing, retained austenite inhibits formation and development of cracks. Because it is work-hardened (strength is enhanced), a tough material can be obtained by adding moderately, but is unstable towards heat. If combined with nitrogen under the proper conditions, penetration by nitrogen makes retained austenite and martensite parent phase (matrix) stable towards heat. Along with using material that is resistant to change, by depositing the proper amount of carbides, fatigue strength can be enhanced without losing cracking strength.

Table 1 Comparison of Impression Shape for Various Materials

Material		Surface hardness [HRC]	Retained austenite amount [%]	Impression diameter [mm]	Impression depth [μm]	Bulge amount [μm]
Through-hardened steel	Standard bearing	62.0	10	2.40	80	5
	TAB bearing	62.0	28	2.45	83	4
Carbonized steel	Standard bearing	61.0	25	2.80	102.5	1
	ETA bearing	62.5	29	2.63	97.5	1
Impression shape example						

(Through-hardened steel standard bearing)

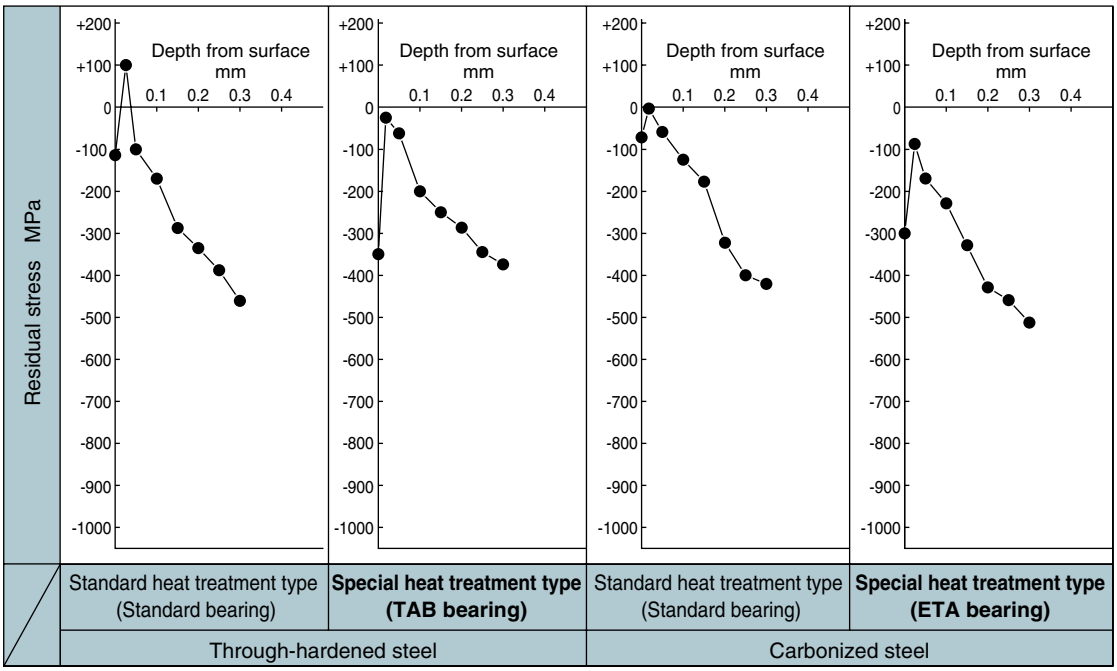


Fig. 1 Residual Stress in Impression

3 Applicable Bearing Size

● Deep groove ball bearings	● Tapered roller bearings
TAB 000～TAB 020 TAB 200～TAB 217 TAB 300～TAB 311	ETA bearings are applied for outer diameters less than 145 mm

Contact **NTN** for information concerning model numbers.

4 Life Test

Results of the life test are as given below. The data given here concerns standard and TAB/ETA bearings. Disparity however results in figures that depend on the type of foreign matter when foreign matter is mixed in with the lubrication oil. This data is provided for your reference.

4.1 Test Bearings and Test Conditions

Test bearings are given in **Table 2**, and test conditions in **Table 3** and **4**.

Table 2 Test Bearings

Bearing	Main dimensions mm	Basic dynamic load rating C_r kN	Basic static load rating C_{or}
Standard 6206	$\phi 30 \times \phi 62 \times 16$	19.5	11.3
TAB206	↑	↑	↑
Standard 30206	$\phi 30 \times \phi 62 \times 17.25$	43.5	48.0
ETA30206	↑	↑	↑

Table 3 Test Bearings (6206, TAB6206)

	Ordinary lubrication oil	Foreign matter mixed in with lubrication oil (reference)
Radial load kN	12.25	6.9
Number of revolutions rpm	2 000	2 000
Lubrication oil	Turbine 56	Turbine 56 + **NTN** standard foreign matter
Lubrication method	Circulating lubrication	Fueling

Table 4 Test Bearings (30206, ETA30206)

	Ordinary lubrication oil	Foreign matter mixed in with lubrication oil (reference)
Radial load kN	17.64	17.64
Number of revolutions rpm	2 000	2 000
Lubrication oil	Turbine 56	Turbine 56 + **NTN** standard foreign matter
Lubrication method	Circulating lubrication	Fueling

4.2 Life Data

Foreign matter mixed in with lubrication oil (reference)

Figures 2 and **3** show the test results with **NTN** standard foreign matter mixed in with lubrication oil. With L_{10} life, TAB bearings last more than five times longer than standard bearings, and ETA bearings last more than nine times longer.

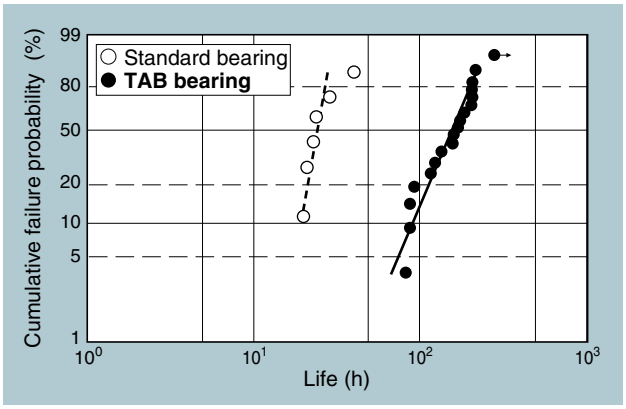


Fig. 2 Comparison of life of TAB ball bearing and standard bearing (with foreign matter)

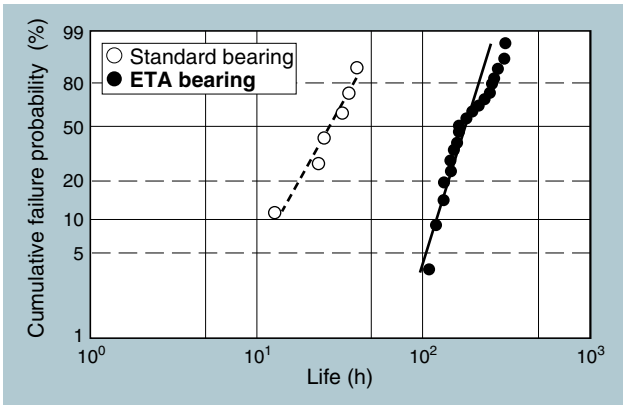


Fig. 3 Comparison of life of ETA tapered roller bearing and standard bearing (with foreign matter)