

Dodge® Type E cones: a history of excellence

The Type E bearing was developed by what was then Dodge in 1943 as a low cost, general purpose, high capacity tapered roller bearing. Since its inception, the product family has grown to include the Double-Interlock (1938), Type K (1965), TAF (1979), and the Type EXL (2012). For much of the product's life, Type E bearing components were purchased from Timken. However, since May 01, 2009, we have manufactured the cone assembly for the Type E family of products. This includes all sizes through a 5" bore.

The redesign of the Dodge Type E was the result of 25 years of experience with ball bearing manufacturing and design, in-depth roller bearing analysis, dynamic testing, and the creation of state-of-the-art manufacturing cells at our bearing facilities in both Rogersville, TN and Marion, NC. The product is controlled by ABB from raw material to its assembly into one of the many Dodge housings. The raw material is turned and heat treated in Rogersville and then shipped to Marion where it is hard-turned, ground, assembled, and tested. The Rogersville facility purchased specialized machining, measuring, and heat treat equipment specifically for the Type E product. The Marion plant purchased new measuring equipment and state of the art CNC OD and ID grinders. In addition, the Marion team developed a dedicated quality lab which ensures tight control over all quality aspects of the product. Below you will find a summary of the advantages of Dodge design and manufacturing of the Type E cone assembly.

Improved Lead Times and Customer Service

It has always been important that Dodge products be manufactured close to our customers. By making the Dodge Type E product independent from Timken, we have taken ownership of its production and distribution. This approach allows our Marion and Rogersville facilities to continuously improve production time and order response. Because of these advancements, customers can enjoy shorter lead times and more expansive stock on our Type E Family products.

Proven Quality

All the time and effort invested into the Type E product family has resulted in a long track record of quality and reliability. Since Dodge began producing Type E cone assembly at the Marion facility, there has not been a single warranty claim for a Type E cone. Through the harshest environments and most demanding applications, the Dodge Type E cone has proven its excellence in performance and reliability.

Appearance

There is a slight visual difference between the Dodge and Timken inner ring that will be noticeable even when the cone is assembled into a housing. The difference is on the flat faces of the inner ring. The Dodge product will have one shiny face and one black face. The Dodge nomenclature, part number and "Made in U.S.A." will be visible on the black face. The Timken inner ring is ground on both ends and has the Timken nomenclature and part number either stamped or laser etched into one face. The country of

origin, however, is not shown on the flat faces of the cone. Instead, Timken prints the country of origin note (“MADE IN INDIA”) on the center rib of the cone, which is hidden once the bearing is assembled.

Dynamic Testing

The Dodge Type E family has a bore range from 1-3/16” to 7”, and all products through a 5” bore use cone assemblies that are manufactured at Marion. This includes 11 different series of bearings. To ensure that this product met or exceeded the Timken products, each of the 11 series of bearings was dynamically tested side-by-side with the equivalent Timken product. The tests were accelerated by inducing extremely high loads and speeds, equivalent to an L10 life of 10,000 hours. The tests were conducted until the 10,000-hour limit was reached. An in-depth analysis was performed on every bearing to determine if the material, design, and manufacturing process were producing an exceptional product. Thermocouples, embedded in each test bearing, recorded temperatures every 15 minutes throughout the life of the test. Such test results were very favorable for the Dodge products.

Material Cleanliness

The cleanliness of the material plays a vital role in the fatigue strength, toughness, and overall life of the end product. The Dodge cone is manufactured from super clean 8620 alloy steel. Our raw material supplier has supplied bearing-quality steel to ABB since 2006 and is one of the world’s largest suppliers of bearing quality steel. The supplier’s quality system has been approved by LRQA Integria AB and conforms to ISO 9001:2000, QS 9000:1998, and is ISO 14001 certified (See Notes). The super clean 8620 alloy steel contains higher fatigue strength due to magnetic induction stirring, vacuum degassing, and controlled teeming. The toughness is also increased due to higher than normal nickel content. The super clean 8620 alloy steel exceeds standards for non-metallic inclusion content per ASTM A534 and oxygen content per ISO683-17 (See Notes). As a last step, quality engineers at Rogersville randomly pulls raw material and perform a full material analysis audit to verify that we are receiving the highest quality steel available.

Cone Assembly Cleanliness

Cleanliness of the cone assembly is extremely important as any foreign contaminate can cause denting of the race and lead to premature failure. Therefore, 100% of Dodge cone assemblies are washed and then dynamically flushed and held to ISO standard 4406:1999 (See Notes). When tested directly against Timken the cleanliness of the Dodge product was far superior. This cleanliness level is maintained in a climate-controlled atmosphere within the Marion plant.

Noise & Vibration Testing

100% of Dodge cone assemblies are tested for noise and vibration per ISO standard 15242-3 (See Notes). Testing by this method is a downstream audit and insurance policy that guarantees the upstream inspection, manufacturing, and assembly processes are producing the highest quality product.



When tested directly against the Timken Type E the Dodge product was found to have vibration & noise levels equivalent or slightly lower.

Roundness

Roundness of the cone is critical to a long bearing life. A perfectly round cone will produce less heat, vibration, noise, and promote true rolling of the roller. If the roller is rotating and tracking as designed, then skidding is eliminated and wear is minimized. Due to the state-of-the-art manufacturing method and heat treat process, the roundness of the Dodge-produced cone is unsurpassed in the world. When tested directly against the Timken Type E the roundness of the Dodge product was found to be 60% better.

Concentricity Race-To-Race

Concentricity race-to-race is critical to bearing life. The Type E product is unique in that a single cone actually has two races. When the race areas are not concentric, the load will not be shared equally between the two races, and increased vibration, noise, heat, and degradation of the lubrication will be the result. This will lead to increased wear and decreased bearing life. Due to the method of manufacturing, the concentricity of race-to-race of the Dodge product is virtually zero. When tested directly against Timken product the race-to-race concentricity of the Dodge product was found to be 80% better.

Optimized Raceway Profile

The Dodge cone contains an optimized crown on the raceway. The rollers and cups have also been manufactured with crown in order to optimize their contact area with the Dodge-produced cone. Crowning the cone, rollers, and cups of the Dodge Type E allows it to accommodate some misalignment which decreases the possibility of edge loading.

Conclusion

In order to control the cost and destiny of the Type E product line it was imperative that ABB start manufacturing the Type E family cone assembly. We now control the design, quality, and availability of the product. As we have seen in the past, the more we control the product the better we can service our customers. We are 100% confident that the Dodge-produced Type E family cone assemblies will meet and or exceed all functional aspects of competitor-purchased products.

Notes:

- ISO 9001:2000 – International quality management system related to meeting customer requirements by ensuring processes are in place to consistently produce the same product.
- QS 9000:1998 – International quality management system standard for the automotive industry which ensures processes are in place to consistently produce the same product.

- ISO 14001 – International quality management system related to meeting environmental requirements and reducing waste.
- ASTM 534 – Standard specification for carburizing steels for Anti-Friction Bearings.
- ISO 683-17 – International standard quantifying cleanliness of heat treated alloy steels.
- ISO 4406:1999 – International standard quantifying particulate contamination levels per milliliter of fluid.
- ISO 15242-3 – International standard quantifying measuring methods for vibration and noise.