



Triondur®

Tailor-made coating systems for heavily loaded components:

- Excellent anti-wear protection
- Very low friction
- Very high tribological and mechanical load carrying capacity
- High hardness values selectable to match the application
- Good emergency running characteristics in conditions of lubricant starvation
- Increased corrosion resistance
- Extended oil change intervals
- Significantly longer component life
- Components can be downsized and designed as lightweight constructions
- Resource savings possible





Triondur® – Tribological coating systems

Triondur® coating systems – see table – are produced in a vacuum using the PVD and plasma-aided CVD processes. In order to ensure optimum function of the coating, the entire process chain is matched to the specific coating system.

Since not only the base material but also the surface to be coated and the functional layer just a few microns in thickness are considered together, the excellent characteristics of Triondur® have an optimum effect.

Triondur® is therefore more than just a coating: it is a coating system that takes account of the complete component.

If you have any questions, please direct these to Central Materials Technology – Coating Systems, Dr. Tim Hosenfeldt, telephone: +49 9132 82-1361, e-mail: Tim.Hosenfeldt@de.ina.com

| Description | Applications | Description | Applications |
|--|---|---|---|
| <p>Triondur® CN is a nitridic chromium coating that, due to its nanocrystalline structure, has particularly high hardness and ductility.</p> <p>The adaptive, very smooth surface is maintained even during operation due to its high wear resistance and very good oil wetting behaviour. This significantly reduces the friction between the contact surfaces.</p> <p>Triondur® CN is the right choice for parts under high load with adequate oil provision.</p> |  <p>■ Engine components</p> | <p>Triondur® C is a carbon-based coating system with a high level of protection against abrasive and adhesive wear that also protects the friction mating surface. Dry friction against steel is reduced by up to 80%. Even if only one friction surface is coated, the operating life of the entire tribological system is increased considerably.</p> <p>Due to its highly ductile coating structure, Triondur® C can withstand the high contact pressures that occur in rolling bearing applications.</p> |  <p>■ Rolling bearing components ■ Engine components</p> |
| <p>Triondur® CNN has very high load carrying capacity and shear strength due to its multilayered structure and the nanodispersive, chromium-based top layer.</p> <p>Due to its good oil wetting behaviour and the adaptive surface, Triondur® CNN is the preferred option for anti-wear protection in conditions of lubricant starvation and oil contamination.</p> |  <p>■ Engine components</p> | <p>Triondur® C+, CX+ are multilayered coating systems for very high tribomechanical loads.</p> <p>The carbon-based top layer with its coating composition optimised for the application offers the highest resistance to abrasive wear of all the Triondur® coatings and a high level of protection against adhesive wear.</p> <p>Due to the supportive, elastic substructure, it has very high mechanical strength. It is thus the best choice for parts subjected to high loads in conditions of lubricant starvation.</p> |  <p>■ Engine components ■ Automotive engineering</p> |

| Coating characteristics | Triondur® C | Triondur® C+, CX+ | Triondur® CN | Triondur® CNN |
|---|--|----------------------|----------------------|----------------|
| Functional layer | a-C:H:Me (Me-DLC) | a-C:H (DLC), a-C:H:X | CrN _x | CrC/CrN |
| Microhardness HV _{0.05} from HU _{0.05} | 1 100 to 1 500 | > 2 000 | > 2 200 | 1 200 to 1 800 |
| Coating thickness in µm | 0,5 to 4 | 2 to 4 | 1 to 4 | 5 to 15 |
| Reduction in friction in an unlubricated system - Triondur®/steel compared with steel/steel | up to 80% | up to 85% | up to 20% | up to 15% |
| Reduction in friction in an oil-lubricated system | The extent of the reduction in friction depends on the boundary conditions of the tribological system (e.g. system roughness, lubricant, relative speed) | | | |
| Protection against abrasive wear | + to ++ | +++ | + | + |
| Protection against adhesive wear | +++ | +++ | + | + |
| Protection against tribooxidation | ++ | ++ | ++ | ++ |
| Protection against corrosion | + | ++ | ++ | ++ |
| Colour | Anthracite | Black | Lustrous silver-grey | Matt silver |

+ Improvement
++ Significant improvement
+++ Very good improvement

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