



## Triondur®

Advantages of tribological coating systems:

- 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
- extended oil change intervals
- significantly longer component life of components
- downsizing and lightweight construction of components
- modular design element for application-oriented components
- conservation of resources in production and application

## Triondur® tribological coating systems






Triondur® coating systems, see table, are produced under vacuum using the PVD and PACVD method. 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 must all be taken into consideration, the excellent characteristics of Triondur® are realised in an optimum manner.

Triondur® is therefore more than just a coating – it is a coating system that takes account of the complete component, from production through to application.

If you have any further questions, please contact our Centre of Competence for surface technology, [Surface.Technology@schaeffler.com](mailto:Surface.Technology@schaeffler.com)

Triondur® is a registered trademark of Schaeffler Technologies AG & Co. KG.

Applications	Description	Applications	Description
 Engine components	<p><b>Triondur® CN</b> 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>	 Engine components, vehicle engineering	<p><b>Triondur® C+</b> is a multilayered coating system for very high tribomechanical loads.</p> <p>The carbon-based top layer with its coating composition optimised to the application offers very high resistance to abrasive wear 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>
 Engine components	<p><b>Triondur® CH</b> is a hydrogen-free amorphous carbon coating. Due to its high hardness, Triondur® CH has the highest wear resistance of all Triondur® coatings.</p> <p>In dedicated tribological systems with appropriately matched lubricants, Triondur® CH gives its most effective action and provides the maximum reduction in friction as well as maximum protection against wear.</p>	 Rolling bearing and engine components, vehicle engineering	<p><b>Triondur® CX+</b> is a carbon-based coating that, due to its nanostructure-based functional layer, allows highly precise matching to the tribological requirements present in the specific application.</p> <p>As a result of the nanostructure basis with non-metallic doping, a combination of minimised friction, tribochemical resistance and wear resistance is achieved that is not possible with any known homogeneous material.</p>
 Rolling bearing and engine components	<p><b>Triondur® C</b> 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>		

Coating characteristics	Triondur® CN	Triondur® C	Triondur® C+	Triondur® CX+	Triondur® CH
Functional layer	Cr <sub>x</sub> N	a-C:H:Me (Me-DLC)	a-C:H (DLC)	a-C:H:X	ta-C
Microhardness HV <sub>0.05</sub> from HU <sub>0.05</sub>	> 2 200	1 100 to 1 500	> 2 000	> 1 600	> 4 000
Coating thickness in µm	1 to 4	0,5 to 4	2 to 4	2 to 4	0,5 to 1
Reduction in friction, unlubricated, Triondur® against steel in comparison with steel against steel	up to 20%	up to 80%	up to 80%	up to 80%	up to 85%
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	Lustrous silver-grey	Anthracite	Black	Black	Iridescent anthracite

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

### Schaeffler Technologies AG & Co. KG

Industriestraße 1–3  
 91074 Herzogenaurach (Germany)  
 Internet [www.ina.com](http://www.ina.com)  
 E-mail [info@schaeffler.com](mailto:info@schaeffler.com)

In Germany:  
 Phone 0180 5003872  
 Fax 0180 5003873

From other countries:  
 Phone +49 9132 82-0  
 Fax +49 9132 82-4950

### Schaeffler Technologies AG & Co. KG

Georg-Schäfer-Straße 30  
 97421 Schweinfurt (Germany)  
 Internet [www.fag.de](http://www.fag.de)  
 E-mail [FAGinfo@schaeffler.com](mailto:FAGinfo@schaeffler.com)

In Germany:  
 Phone 0180 5003872  
 Fax 0180 5003873

From other countries:  
 Phone +49 9721 91-0  
 Fax +49 9721 91-3435