

Enhanced automotive component coatings with **BALIFOR T**

The ta-C solution for high temperature
environments



Automotive



BALIFOR T is the highly reliable ta-C solution for the automotive industry

The automotive industry is constantly pushing the limits of technology to deliver lighter, quicker, environmentally friendly and more reliable cars with new functionalities. With a long lasting experience in the automotive sector, Oerlikon Balzers is familiar with the requirements, processes and standards of the industry, covering the complete value chain.

Carbon-based protective coatings for automotive applications with their individual properties are part of the

portfolio of Oerlikon Balzers. But in some applications, DLC (Diamond-like-Carbon) coatings may reach their limits with respect to their operating temperatures exceeding more than 350° C, intermittently dry running and due to their incompatibility to aggressive additives (e.g. high concentration-MoDTC).

Where DLC cannot meet the requirements, the ta-C-coating from Oerlikon Balzers, BALIFOR™ T, is the solution.

BALIFOR T is part of a complete solution portfolio

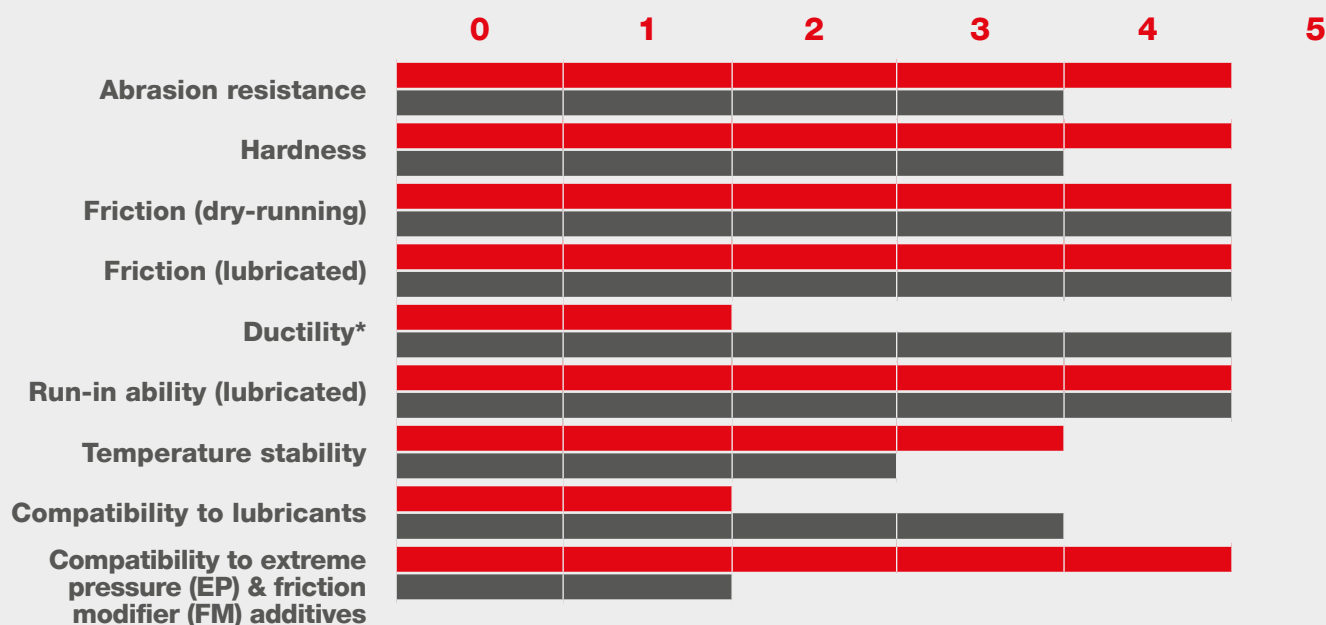
BALIFOR™ T is an additional surface solution technology which can be offered globally. Our portfolio comprises of solutions from BALINIT® DLC through BALIFOR™ M to BALIFOR™ T – and our technical experts will consult you in the choice of the perfect fit for your application. A seamless switch from BALINIT® DLC to BALIFOR™ T is part of the game.

BALIFOR™ T offers the differentiating characteristics for:

- **High temperature applications (depending on pressure)**
- **Low lubrication applications for longer periods**
- **Aggressive additive environments**

ta-C compared to a-C:H (DLC)

Subjective assessment in 6 steps from 0 (not suitable) to 5 (excellent)



*: (due to the high hardness of ta-C)

	Coating thickness (typical (µm))	Hardness (typical (GPa))	Coefficient of friction (dry)	Wear resistance (rating --/0/+/++)	Compatibility to lubricants (rating --/0/+/++)	Temperature stability (°C)	Ductility (rating --/0/+/++)
ta-C Tetrahedral amorphous carbon without hydrogen	1 – 2	> 40	0.1 – 0.2	++	--	450 – 500	-
a-C:H Amorphous carbon with hydrogen	1 – 5	15 – 25	0.1 – 0.2	+	- / 0	200 – 350 (pressure dependent)	0

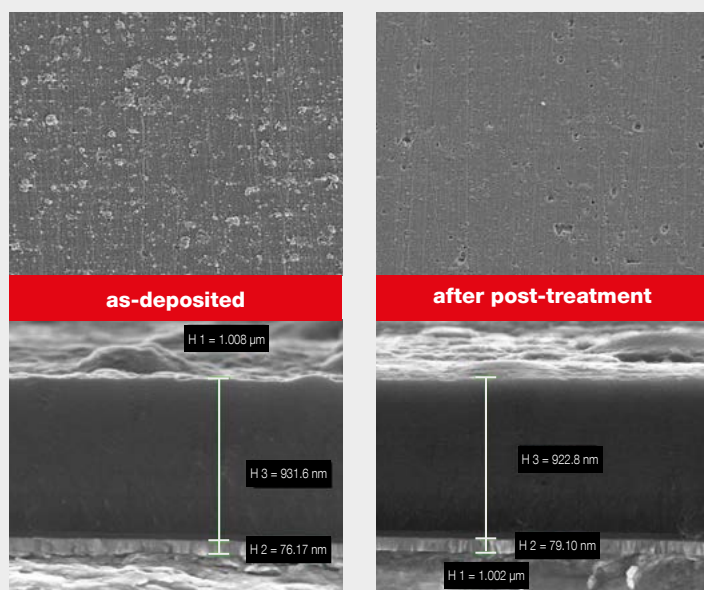
All given data are approximate values, they depend on application, environment and test conditions.

The high-tech coating solution for high-spec requirements

Setting the standards in coating technology for decades, Oerlikon Balzers has delivered ta-C coatings with a high energy arc-evaporation process for years, now rolling them out into the automotive market in one combined solution that includes pre- and post-treatment. This „package“ includes the unique Controlled Contact Pressure Post-Treatment Process explicitly customised by Oerlikon Balzers, thus constantly delivering reliable results.



Scanning electron microscope (SEM) for BALIFOR T on piston pins



Target specifications for BALIFOR T on piston pins

Coating thickness (total) (µm)	1.2 ± 0.3
Adhesion layer / support (µm)	< 0.25
Coating hardness H_{it} (GPa)	42 ± 5
HV = 92.62 H_{it}	3,900 ± 450
Roughness	
Rz (µm)	< 0.5
Rpk (µm)	< 0.05
Rpkx (µm)	< 0.20
Roughness raw part before coating	
Rz (µm)	< 0.4
Rpk (µm)	< 0.04

Your reliable partner for tailor-made ta-C-coatings: BALIFOR T

Oerlikon Balzers has been powered by innovation for over 70 years. Our customers benefit from our global presence, with over 100 coating centres all around the world. For more than 20 years we have been partnering with the automotive industry, and have profound knowledge of pre- and post-treatments. Oerlikon Balzers offers a ta-C-solution that fulfills all expectations.

Our globally controlled and standardised processes guarantee reproducibility and can therefore produce identical results all over the world: be it for the same production in different locations, or for the transfer from one location to another. Oerlikon Balzers fulfills the automotive standards in requirements, processing and industry, covering the complete value added chain from Tier 2 to OEMs.

Rely on our expertise

Benefit from Oerlikon Balzers' global experience and contact your nearest customer centre. Test your parts in your specific application. Samples are available with a lead time of only a few weeks! Or contact your local representative for a joint development approach.



Explore the possibilities of BALIFOR T with us, contact us today!

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