

## CERTESS<sup>®</sup> CARBON

CARBON layers correspond to DLC (Diamond Like Carbon) coatings for tribological use. These coatings usually consist of several sub-layers of different materials: Cr, CrN, WC, WCC, combined with a top layer of hydrogenated (a-C:H) or non-hydrogenated (ta-C) amorphous carbon. Another variant is an a-C:H coating doped by W (a-C:H(W)).

### Characteristics:

- Hardness from 500 to 6000 HV
- Excellent friction properties
- No hydrogen embrittlement
- Respect of dimensions and roughness

### Materials suitable for treatment:

- Steels and cast irons - Carbides • Dense sintered materials • Inconel alloys • Aluminium, copper and titanium alloys

### Examples of use:

- Engine components • Mechanics components • Valves • Camshafts • Tappets • Fork tubes • Gears • Injection systems

CERTESS<sup>®</sup> CARBON layers, processed by PACVD (Plasma Enhanced Chemical Vapor Deposition), are amorphous carbon-based coatings (DLC).

They have the advantage of a high hardness (1500 - 3200 HV), but also a much lower coefficient of friction than conventional hard coatings such as TiN, TiCN... (5 to 10 times lower).

This unique combination of properties has opened up new possibilities for improving technical parts such as engine components.



HEF is strongly involved in the development of technologies aimed at reducing fuel consumption and CO<sub>2</sub> emissions in the automotive industry; solutions developed by HEF are already used by engine manufacturers worldwide to improve friction:

- rocker arm systems
- mobile hitch systems
- transmission systems

These coatings typically comprise several layers of different materials such as Cr, CrN, Si, W, WC-C, combined with a top layer of amorphous carbon, enriched or not with hydrogen.

The selection of the sublayer is based on a number of factors such as: grip requirements, wear pattern, contact type, friction regimes encountered during operation, applied load...

Coatings	Architecture	Thickness	Hardness	Treatment temperature	Maximum temperature of use	Applications
Certess® DT	a-C:H(W)	2-4 µm	1000-1500Hv	150 - 350°C	350°C	Low friction Adhesive wear Moderate abrasive wear Automotive components Dry lubrication
Certess® DDT	WC,C + a-C:H	2-4 µm	Full range: 1000-2800 Hv Characteristic: 2000-2200Hv	150 - 350°C	350°C	Very low friction Adhesive wear High abrasive wear Automotive components
Certess® DCX	Cr,N + a-C:H	2-4 µm	Full range: 1000-2800 Hv Characteristic: 2000-2200Hv	150 - 350°C	350°C	High contact pressure Very low friction Adhesive wear High abrasive wear Automotive components
Certess® DCY	Cr + WCC + a-C:H	2-4 µm	Full range: 1000-2800 Hv Characteristic: 2000-2200Hv	150 - 350°C	350°C	Very high contact pressure Very low friction Adhesive wear High abrasive wear Automotive components
Certess® DCZ	CrN + WCC + a-C:H	2-4 µm	Full range: 1000-2800 Hv Characteristic: 2000-2200Hv	150 - 350°C	350°C	Very high contact pressure Very low friction Adhesive wear High abrasive wear Automotive components Impacts
Certess® TC	ta-C	1-5 µm	3000-7000Hv	150°C	450°C	Very high abrasion wear Tribo-corrosion Very low friction Adhesive wear Automotive components

