# DIAMOND LIKE CARBON (DLC) COATING PROPERTIES

The properties of DLC coatings in terms of hardness; coefficient of friction; roughness; adhesion level; load carrying capacity; resistance to humidity influenced degradation; fatigue tolerance, etc. can be tailored over a wide range depending upon deposition parameters, deposition technology and the combination of materials constituting the coating. Some of the more common commercial variants of WCC and DLC coatings from Calico are as follows:

| PROPERTIES | COATINGS | | | | | |
|---|---|---|---|---|---|---|
| | **CERTESS DT** a-C:H:W | **CERTESS DTMO** a-C:H:W (modified) | **CERTESS DLC** a-C:H | **CERTESS DCX** crN + a-C:H | **CERTESS DDT** WC + a-C:H:W + a-C:H | **CERTESS DCY** CR + WC + a-C:H:W + a-C:H |
| Hardness (HV) | 1200 -1400 | 1700 - 1900 | 2000 - 2500 | 2500 - 3200 | 2000 - 3200 | 2500 - 3200 |
| E (GPa) | 125 | 140 | 200 - 210 | 200 - 210 | 200 - 210 | 200 - 210 |
| Coeff. of Friction (dry) | 0.20 - 0.25 | 0.20 - 0.25 | 0.11 - 0.15 | 0.11 - 0.15 | 0.11 - 0.15 | 0.11 - 0.15 |
| Coeff. of Friction (5W30) | 0.10 - 0.15 | 0.10 - 0.15 | 0.07 - 0.11 | 0.07 - 0.11 | 0.07 - 0.11 | 0.07 - 0.11 |
| Scratch LC (N) | 60 | 60 | 20 | 25 | 25 - 30 | 30 |
| Load Bearing Cap (arb. units) | 1 | 1 | 3 | 8 | 9 | 9 |
| Coating Thickness (microns) | 1 - 3 | 1 - 3 | 1 - 3 | 2 - 4 | 2 - 4 | 2 - 4 |
| Deposition Temp. °C | 150 - 300 | 150 - 300 | 150 - 300 | 150 - 300 | 150 - 300 | 150 - 300 |
| Max Usage Temp. °C | 300 | 300 | 350 | 350 | 350 | 350 |

Calico evaluates the specific tribological conditions experienced by the component to make recommendations regarding specific DLC coating options.

**DLC Based PVD Coatings**

**CERTESS® DC:** a-C:H
**CERTESS® DCX:** Cr(x)N(y) a-C:H
**CERTESS® DCN:** CrN a-C:H
**CERTESS® DCP:** Cr + a-C:H
**CERTESS® DDT:** WC-C + a-C:H
**CERTESS® DCY:** Cr + WC-C + a-C:H

**Under-Layer Various Options**

**Top-Layer Carbon Based**

**Hardness: 2800 - 3200 HV**

Top Layer ⟶ a-C:H
Under Layer ⟶ range of materials- selection dependent upon:

- Requirement of load bearing capacity
- Wear & Contact Modes
- Substrate & carbon layer adhesion counter-part considerations

Other DLC coatings can be customized based upon the unique combination of wear mode, contact mode and the friction regime under which the component in operating.