



# DLC PRODUCT FAMILY

## Diamond Like carbon

Diamond Like Carbon (DLC) is the name of a hard and smooth carbon-based surface - something like a mixture of graphite and diamond.

### Low friction

DLC-TR and DLC-Si are low friction PVD coatings, developed by the Tribology Centre, consisting of a functional gradient coating (FGC) of diamond like carbon. DLC-Si is doped with a little silicon, which contributes to improved hardness and increased temperature stability compared to DLC-TR. As a general rule, our DLCs are applied on metal parts with the purpose of reducing the friction and minimizing the risk of galling/seizure.

### DLC-TR for moving tool and machine parts

Machine and tool parts in sliding or rotating motion are normally subject to wear and further, it is often desired to have the lowest possible friction. Traditionally, the solution is lubrication with grease or oil.

Grease and oil lubrication requires that speed, load, geometry and lubricants are adjusted to each other, otherwise, the result will often be excessive wear or even galling of the parts.

One of our DLC coatings may be the solution to the problem. Our DLC-TR coating can be run dry or in combination with traditional lubrication. Combined with oil or grease the DLC-TR coating will provide the lubrication, even if the asperities of the surfaces penetrate the lubrication film.

The DLC-TR coating solves most problems, but it may

be advantageous to apply the DLC-Si coating, when a higher hardness is required or the operating temperature of the coated part is too high.

### Oily or greasy plastic parts - not with DLC-TR and DLC-Si

Movable cores and ejectors require frequent lubrication to prevent galling. The lubricant will often come off on the finished parts and this is not acceptable in e.g. the food processing and medical industry. Neither is it acceptable if the parts are to be decorated. A DLC-TR coating will solve this problem.

### IBAD-DLC

IBAD-DLC is an ion beam assisted deposition of a carbon film, which is used primarily on hardened steel tools. The simultaneous ion implantation and coating ensure a certain mixture of the materials in the boundary layer between coating and base material, giving an extraordinary good adhesion.

### Sheet Metal forming

By minimum lubrication or lubrication-free sheet metal forming, IBAD-DLC is an excellent choice. Forming without or with only little lubricant is important in the further processing of the parts in order to reduce removal of lubricant residues.

### Lubrication with water

Lubrication of metal components by water is usually not possible, i.a. due to the very low viscosity of water. If at least one of the sliding or bearing surfaces is coated with DLC-TR or DLC-Si, there will be no risk of galling on the components operating in water - not even by dry running.

## Contact:

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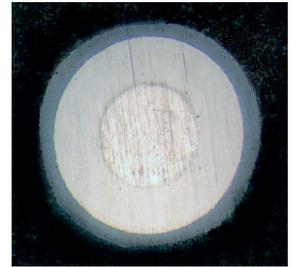


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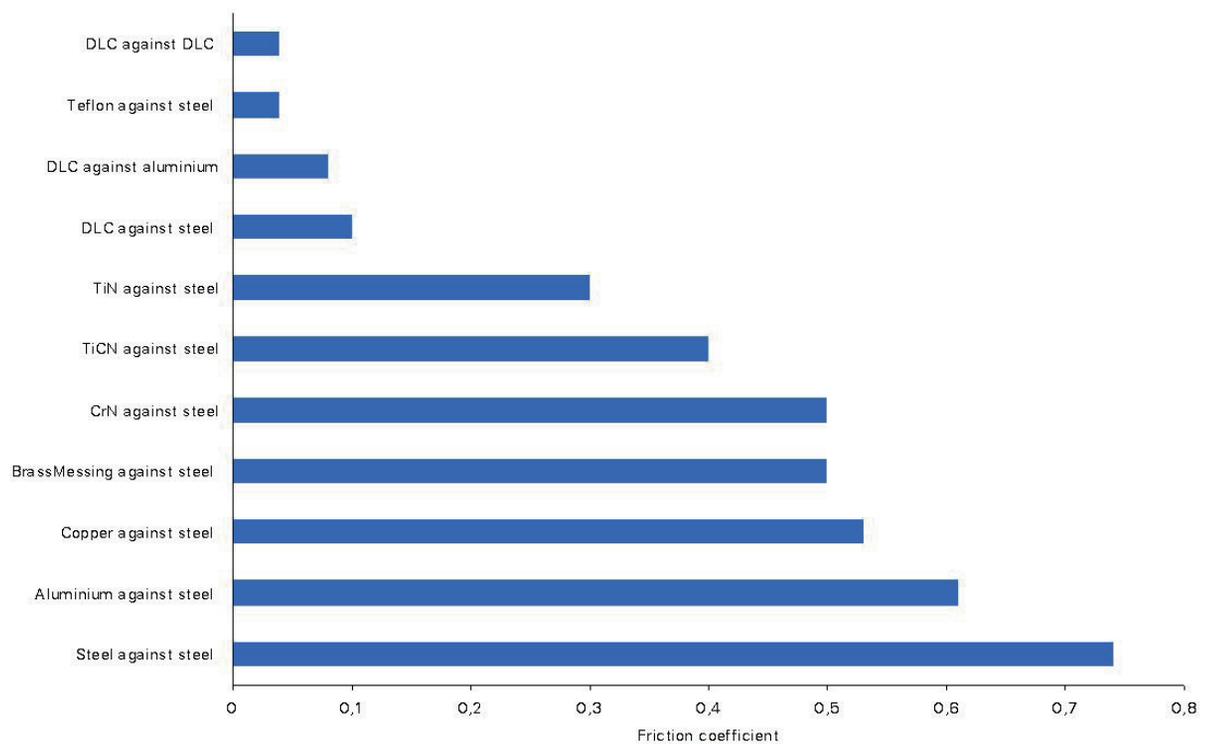
Colour: Black



PRODUCT VARIATIONS	DLC-TR	DLC-Si	IBAD-DLC
Micro hardness* [HV]	~1500	~2000	~1300
Process temperature [°C]	<200	<200	~50
Application temperature, max. [°C]	~220	~300	~200
Friction coefficient against steel	0,1	0,1	0,05-0,1
Processing method	PVD	PVD	II
Coating type	FGC	FGC	FGC
Standard layer thickness [µm]	3-5	2,5-5	1

\* Measured by nanoindentation

## Examples of friction coefficients



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