Premium Coatings
for your Precision Tools
Electromobility, Communication, Medical Technology
Develop your Business in these Markets with CemeCon Coating Technologies.

50 \% of a perfect coating

... is the choice of the right coating material. With CemeCon Engineering, we tailor the other 50 \% to premium coating!

High-performance coating materials are the precondition for first-class coatings.

Your precision tool with its individual form, function and objectives is our focus. Starting with the development phase of your tool, our coating experts work together with you, because a successful precision tool is the result of an optimal substrate, elaborated geometry and the best individual premium coating.

Unrivaled Products through CemeCon Engineering
We fit your Individual Coating perfectly to your Precision Tool.

35 years of coating know-how enable us to produce perfect products from outstanding cutting tools. We open up completely new levels of performance in machining and thus also particularly attractive sales markets.

Your individual premium coating in 2 steps:
1. selection of the suitable coating process and assembly of the appropriate coating material specification for your precision tool. Adapted to the machining task, specified application parameters and other technical and commercial objectives for your precision tool, we will compose your premium coating from a wide range of options. This includes, for example, the pre- and post-treatment, the coating thickness, final dimension with measurement report, tolerances, colors, packaging and much more.
2. you supply us with your prototypes, we coat them with the best coating materials in the world, then you test the quality of the tool in use.

Together we achieve the desired performance goals of your precision tool.

We are technology developers, equipment manufacturers, and coaters in one.

In the world’s largest coating center, we coat up to 80,000 precision tools every day.

We use this wealth of experience to ensure that each tool is treated the optimal way. Strictly separated batches, individual production processes, and precise documentation ensure that your recipe for success is guaranteed at all times and all over the world with equally perfect results.

Our coating experts are just a click away: coatingservice@cemecon.de
## The Right Coating for Round Tools

<table>
<thead>
<tr>
<th>Drilling</th>
<th>Steel</th>
<th>Stainless steel</th>
<th>Cast Iron</th>
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# The Right Coating for Cutting Inserts

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The patented CemeCon multilayer technology ensures maximum stability of the individual layers within the coatings. Due to their extremely high hardness – with up to 10,000 HV0.05 close to natural diamonds – all coatings of the product group CCDia® are extremely wear-resistant. The performance of shank tools and inserts made of solid carbide is increased significantly with a CCDia®-coating. The high thermal conductivity of the diamond coating ensures rapid heat dissipation. This is important when processing temperature sensitive materials like CFRP and GFRP and enable a higher machining speed during manufacturing.

All these properties make the coating materials of the CCDia®-series the first choice for machining of graphite, composites, non-ferrous metals, green parts, and ceramics according to VDI standard 3323.

### Characteristics of the Coating Materials

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<th>Coating material</th>
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Diamond – the Hardest Material in the World

Cutting of Graphite, CFRP, GFRP, Composites, Abrasive Non-ferrous Metals and Ceramics with Patented Multilayers.

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The Advantages of our Diamond Coatings at a Glance

The patented CCDia®-multilayer-diamond-coatings have excellent adhesion because they are adapted to the carbide, geometry, and application. At the same time, they form very smooth surfaces.

Wide range of coating thicknesses

From thin coatings to very thick diamond coatings, CCDia®-coatings are high-precision up to 20 µm coating thickness.

Precision is a matter of course

You would like to have your tools coated to a specific final diameter including a measurement report? Thanks to our hot filament process, complex three-dimensional tools and components receive a particularly homogeneous coating thickness distribution with narrow tolerances. We attach great value on precision.

Excellent adhesion and very smooth surfaces

The Diamond Coatings from the CCDia®-series clearly stand out from other Solutions.

Special material requirements – Best machining results

Due to their extreme hardness close to natural diamond, combined with high thermal conductivity, diamond-coated tools achieve long tool life and best machining results in high-tech materials.

High process reliability

The crack-stopping properties of CCDia®-coatings ensure high process reliability in the machining process.

World market leader for 25 years in diamond coating

The machining of demanding materials in dental and medical fields or the production of cell phone molds are not conceivable without diamond-coated tools. CemeCon is the pioneer of diamond coating for cutting tools and has offered its customers the advantages of this technology for more than 25 years.

Open for carbides

Over 80 carbide grades, including grades with increased cobalt content (9 – 10 %), are best suited for coating with CCDia®-coating materials.
**CCDia® CarbideSpeed®**

Milling Sintered Carbide instead of Eroding

Milling hard metals instead of eroding them or grinding has enormous advantages: shorter cycle times, better surface quality, more environmentally friendly machining, no corrosion, and the production of more complex contours. With the newly developed CCDia® CarbideSpeed®, we offer tool manufacturers a precisely matched diamond coating material which creates ideal conditions even for the hardest operating conditions.

**TECHNICAL DATA**

- Coating technology: Diamond
- Microhardness: 10,000 HV 0.05
- Composition of the coating material: Multilayer
- Color: Grey-Shiny
- Max. operating temperature: 650 °C

**APPLICATION EXAMPLE: A MILESTONE FOR TOOL AND MOULD MAKERS**

- Material: Sintered Carbide, 20 % Co
- Tool: Coated ball nose end mill
  - n = 30,000 min⁻¹
  - vₕ = 350 mm/min
  - aₚ = 0.15 mm
  - αₜ = 0.08 mm
  - Q = 0.0042 cm³/min

- Tool life (mm³)
  - 454
  - 300
  - 150
  - 0

- Coating material: CCDia® CarbideSpeed®
- 0 = uncoated/PVD coated (machining operation not possible)
- 450 = CCDia® CarbideSpeed®

**APPLICATION EXAMPLE: PERFECT SURFACE QUALITY THROUGHOUT THE ENTIRE TOOL LIFE**

- Material: CFRP, IMA-M21E
- Tool: Carbide countersink-drill
  - d = 5.6 mm
  - d₀_central = 12.5 mm
  - f = 0.05 mm
  - n = 6000 min⁻¹

- Tool life (number of holes)
  - 980
  - 800
  - 600
  - 400
  - 200
  - 100

- Uncoated
  - 0

- Available coating thicknesses:
  - ≤ 3 µm
  - ≤ 9 µm
  - ≤ 14 µm

**CCDia® AeroSpeed®**

for CFRP, GFRP, Composites

The Premium Diamond Coating CCDia® AeroSpeed® was developed in order to achieve the highest surface qualities with the machining of fiber materials. The excellent adhesion combined with the unique smoothness guarantee productive drilling and milling of CFK, GFK and composites. Additionally, the very sharp cutting edge enables a better separation of the fibers. CCDia® AeroSpeed® is also suitable for solid carbide grades with increased cobalt content. The increased toughness of these grades in combination with a diamond coating enables process-safe drilling in aircraft construction.

**TECHNICAL DATA**

- Coating technology: Diamond
- Microhardness: 10,000 HV 0.05
- Composition of the coating material: Multilayer
- Color: Grey-Shiny

**APPLICATION EXAMPLE: PERFECT SURFACE QUALITY THROUGHOUT THE ENTIRE TOOL LIFE**

- Tool life (number of holes)
  - 980
  - 800
  - 600
  - 400
  - 200
  - 100

- Uncoated
  - 0

- Available coating thicknesses:
  - ≤ 3 µm
  - ≤ 9 µm
  - ≤ 14 µm
CCDia®CarbonSpeed®
for Graphite and Green Materials

Ultra-hard against abrasion wear: CCDia®CarbonSpeed® is the coating solution when economical machining of graphite and green materials is required. Coatable on more than 80 carbides, its unique fine crystalline and smooth multilayer structure provides process reliability and best the workpiece surfaces.

TECHNICAL DATA

Coating technology: Diamond
Microhardness: 10,000 HV0.05
Composition of the coating material: Multilayer, sp³
Color: Grey
Max. operating temperature: 650 °C
Available coating thicknesses: • • •

APPLICATION EXAMPLE: COST-EFFECTIVENESS COMBINED WITH A HIGHLY RELIABLE PROCESS

Materials: EDM graphite ISO-63
Tool: Endmill
vₜ = 600 m/min
fᵣ = 0.06 mm/tooth

Tool life (m)

500
400
300
200
100
0

CCDia®CarbonSpeed®

7 µm

400

20

CCDia®CarbonSpeed®

7 µm

uncased

CCDia®FiberSpeed® and CCDia®MultiSpeed
for CFRP/GFRP/Ceramics

Layer thicknesses of 3 to 14 µm make CCDia®FiberSpeed® and CCDia®MultiSpeed universal and economical solutions for drilling and milling of fiber composites and ceramics. The very good adhesion gives highly reliable processes and different coating thicknesses give sharp cutting edges or maximum wear volume.

TECHNICAL DATA

Coating technology: Diamond
Microhardness: 10,000 HV0.05
Composition of the coating material: Multilayer, sp³
Color: Grey
Max. operating temperature: 650 °C
Available coating thicknesses:

3 µm

9 µm

14 µm

17 µm

APPLICATION EXAMPLE: HIGH WEAR VOLUME FOR MAXIMUM PERFORMANCE

Materials: CFRP, M21E
Tool: Solid carbide drill, ø 5.6 mm
fᵣ = 0.06 mm/tooth
n = 6500 min⁻¹

Tool life (number of holes)

1500
800
400
200
100
0

CCDia®FiberSpeed®

15 µm

950

950
800
400
200
100
0

uncasused
<table>
<thead>
<tr>
<th>Application examples</th>
<th>Material to be machined</th>
<th>Diamond coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowns, inlays and bridges in the dental technology</td>
<td>Zirconium oxide</td>
<td>CCDia®CarbonSpeed®</td>
</tr>
<tr>
<td>Structural components for aircraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back implants</td>
<td>Fiber reinforced plastics (CFRP/GFRP)</td>
<td>CCDia®AeroSpeed®</td>
</tr>
<tr>
<td>Sporting goods such as bicycle rims</td>
<td></td>
<td>CCDia®FiberSpeed®</td>
</tr>
<tr>
<td>Lightweight construction components for e-mobility</td>
<td></td>
<td>CCDia®MultiSpeed</td>
</tr>
<tr>
<td>Graphite electrodes for the mold production of displays</td>
<td>Graphite</td>
<td>CCDia®CarbonSpeed®</td>
</tr>
<tr>
<td>Stamps and dies for forming</td>
<td>Carbide</td>
<td>CCDia®CarbideSpeed®</td>
</tr>
<tr>
<td>Lightweight components in automotive engineering</td>
<td>Hypereutectic aluminum</td>
<td>CCDia®FiberSpeed®</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CCDia®MultiSpeed</td>
</tr>
</tbody>
</table>

As the market leader, we offer sustainable diamond coatings for the challenges in machining of graphite, in aviation, 3C industry (computer, communication, and consumer electronics) and medical technology.
HiPIMS Provides Maximum Flexibility. The Largest Range of Coating Materials and Substrates is Possible.

HIPIMS (High Power Impulse Magnetron Sputtering) combines the advantages of all coating technologies used for cutting tools. Smoothness without any droplets, high hardness, compact layer structures, and scratch loads over 130 Newton make the difference. Tools coated in this way offer excellent protection against wear in extremely hard, especially tough and oxidation-resistant materials such as stainless steel, titanium or nickel-based alloys. HIPIMS coatings also achieve their full performance in unalloyed, alloyed and high-speed steels. High metal ionization close to 100% ensures the best coating adhesion, even in materials that particularly difficult to machining such as cold welds.

AluCon®
for Aluminum, Titanium and Non-ferrous Metals

TiB₂ and HIPIMS. The unique combination of nanocrystalline, extremely dense coating material, which effectively prevents build-up edges and the HIPIMS technology for smoothest coatings, maximum coating adhesion, and a hardness of up to 5,000 HV. This guarantees optimal cutting results in non-ferrous metals, even at high operating temperatures.

Advantages of HiPIMS
- Flexibility
- Coating thickness
- Smoothness
- Adhesion
- Hardness/Toughness
- Shift rate
- Layer distribution

ALEN V4

Coating technology:
HIPIMS
Composition of the coating material:
TiB₂-based
Color:
Silver
Max. operating temperature:
1,100 °C
Available coating thickness:
= 2 µm
The Advantages of our HiPIMS Coatings at a Glance

HiPIMS Coatings are the Future of PVD Technology.

**Perfect for heavy duty machining**
HiPIMS coatings from CemeCon, such as FerroCon®Quadro, are available in a coating thickness of up to 12 µm. Only our HiPIMS can do this!

**Homogeneous coating of the cutting edges**
The high level of ionization produces a denser structure and compact coatings which are at the same time very hard and tough. Using the HiPIMS technology, deposited coatings grow extremely homogeneously. Even very complex tool geometries are coated with approximately the same coating thickness around the cutting edge.

**Perfect for micro tools**
Defect free and without antenna effects. HiPIMS is perfect for very small geometries since there are no disturbing droplets and it does not produce damaged or rounded cutting edges.

**Very dense and almost amorphous layer structures**
The power peaks of the HiPIMS process form a high-energy plasma, which ionizes deposited materials in a so far unmatched degree. The high flow of highly ionized particles forms very dense and almost amorphous coating structures.

**Very good residual stress management**
HiPIMS reduces the residual stress in the coating radically. This enables a high range of coating thickness. In contrast, AR coatings have to deal with high compressive stress and CVD coatings with tensile stress.

**Extremely smooth and droplet free**
In contrast to droplets on the surface using other coating methods such as Arc, the surfaces are extremely smooth when using the HiPIMS process.

**Maximum flexibility in material selection**
HiPIMS is a sputtering process and nearly every material can be sputtered. This means an unlimited material variety due to the combination possibilities of the elements of the periodic table for the production of coatings.

**Protection against thermal overload**
HiPIMS coatings have a coating structure with higher density and thereby have more favorable thermophysical properties in machining. They are thermally insulating and better protect the substrate from the heat generated in the machining process. The heat is mainly removed by the chip which protects the substrates from thermal overload.

**Thermal conductivity of coatings**
The high level of metal ionization ensures best adhesion. A scratch load of 120 Newtons for the Si-doped – and therefore very hard – InoxCon® coating is extraordinary. The ATIm-based product FerroCon® achieved up to 130 Newtons. This enables the machining of the most difficult materials.
FerroCon®
For Unalloyed, Alloyed and High-speed Steel (Ferrous Materials)

The premium HIPIMS coating for high-performance applications in unalloyed, alloyed and high-speed steel. Optimum adhesion, smoothest surfaces, high hardness values and toughness for your tool. Pure performance.

FerroCon®Quadro
for Highest Wear Volume

With FerroCon®Quadro, up to 12 µm can be realized with strong adhesion! For the processing of cast iron and steel this gives completely new possibilities. Everywhere where thick chips fall, such as for heavy machining and turning certain materials, protective coatings are vital for the tool and ensure high productivity. Very smooth and adhesive coatings are deposited using PVD coating processes. However, many applications require thicker layers, which so far have been produced exclusively by CVD.

TECHNICAL DATA

Coating technology:
HIPIMS
Composition of the coating material:
AlTiN-based
Color:
Anthracite
Max. operating temperature:
1,100 °C
Available coating thicknesses:

≤ 1.5 µm • • •
≤ 3 µm • • •
≤ 4.5 µm • •
≤ 6 µm — — •

APPLICATION EXAMPLE: PERFORMANCE THANKS TO HIPIMS

Material: 40CrMoV4-6
Tool: Cutting insert
vₜ = 250 m/min
aₘ = 3 mm
z = 2

Standzeit (Werkstücke)

<table>
<thead>
<tr>
<th>30µm</th>
<th>40µm</th>
<th>50µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>398</td>
<td>211</td>
<td></td>
</tr>
</tbody>
</table>

FerroCon®

AlCrN

TECHNICAL DATA

Coating technology:
HIPIMS
Composition of the coating material:
AlTiN-based
Color:
Anthracite
Max. operating temperature:
1,100 °C
Available coating thicknesses:

≤ 12 µm • • •

APPLICATION EXAMPLE: EXTRA HIGH WEAR VOLUME FOR ROUGHING OPERATIONS IN STEEL AND CAST IRON

Material: 1,0503 (C45), 32 HRC
Werkzeug: Fräser mit Wendeplatten
vₜ = 220 m/min
aₘ = 0,5 m/min
Ohne Kühlung

Standzeit (in min)

<table>
<thead>
<tr>
<th>200</th>
<th>160</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>120</td>
<td>65</td>
</tr>
</tbody>
</table>

FerroCon®Quadro

Competidor 1, 2, 3
**InoxaCon®**
for Stainless Steels/Titanium up to 70 HRC

Developed for machining of hardened and high alloyed steel as well as titanium. Its very high thermal stability makes the silicon-doped material InoxaCon® the first choice for your high-end tools.

**TapCon®Gold**
Best Performance in Thread Production for Steels/Aluminum/Cast Iron

The golden HiPIMS coating material TapCon®Gold is the first choice when it comes to the perfect coating of HSS threading tools. TapCon®Gold offers optimal adhesion to HSS, optimized wear resistance, and an extremely smooth surface which is ideal for low torque.

---

**APPLICATION EXAMPLE:**
HEAT RESISTANT AND REDUCED REWELDING

**Material:** 1.4301  
**Tool:** Solid carbide mill, ø 8 mm  
**vₜ:** 80 m/min  
**fₜ:** 0.035 mm/tooth  
**aₜ:** 5 mm  
**aₚ:** 3 mm  
**z:** 4  
**Max. wear (µm):**
- 0  
- 20  
- 40  
- 60  
- 80  
- 100

**Coating technology:** HiPIMS  
**Composition of the coating material:** TiAlSiN-based  
**Color:** Red gold  
**Max. operating temperature:** 1,100 °C  
**Available coating thicknesses:**
- ≥ 1.5 µm  
- ≥ 3 µm

---

**APPLICATION EXAMPLE:**  
THE LAYER FOR THE PERFECT THREAD

**Material:** Heat-treated steel  
**Tool:** HSS Tap M8 x 1.25  
**vₜ:** 42 m/min  
**Max. operating temperature:** 900 °C  
**Available coating thickness:**
- ≥ 3 µm

**Coating technology:** HiPIMS  
**Composition of the coating material:** AlTiN-TiN-based  
**Color:** Gold  
**Torque (Nm):**
- 2.73  
- 3.37

---

**Coating technology:** HiPIMS  
**Composition of the coating material:** AlCrN  
**Color:** Red gold  
**Max. operating temperature:** 1,100 °C  
**Available coating thicknesses:**
- ≥ 1.5 µm  
- ≥ 3 µm
SteelCon®
High Process Stability in Hard Machining
HRC ≥50

SteelCon® is the third silicon-doped HiPIMS coating material from CemeCon and enables economical machining under the extreme conditions of hard machining with first-class surface quality. SteelCon® is highly resistant to wear. Highest temperature resistance is combined with excellent adhesion. The very homogeneous wear behavior of SteelCon® ensures high process stability. In addition to the dense layer structure, the very high silicon doping also ensures high thermal stability.

Since no droplets can form thanks to the HiPIMS process, SteelCon® is also extremely smooth. The tool can dissipate the heat in the chip, and process stability increases. Excellent surface qualities are produced, which saves reworking of the workpieces.

TECHNICAL DATA

Coating technology:
HiPIMS
Composition of the coating material:
TiAlSiN-based
Color:
Red gold
Max. operating temperature:
1,100 °C
Available coating thicknesses:
≤ 1.5 µm
≤ 3 µm

APPLICATION EXAMPLE:
DIE AND MOULD MAKING

Material:
1.2379: 62HRC
Tool:
Ball nose end mill, Ø 6 mm
v₁ = 120 m/min
n = 6366 U/min
f = 0.13 mm
a₀ = 0.1 mm
a₁ = 0.1 mm
Cooling: Air
Never before has the Decision for the Right Coating Technology been so easy!

HiPIMS (High Power Impulse Magnetron Sputtering) is sputtering with increased energy – with full control of the energy input – and combines the advantages of all current technologies. HiPIMS produces smooth, droplet-free, and low-stress coatings in an almost unlimited variety.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Coating temperature</th>
<th>Max. coating thickness</th>
<th>Residual stress of the coating</th>
<th>Toughness of the coating</th>
<th>Easy production</th>
<th>Flexibility</th>
<th>Mini tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
<td>Droplets</td>
<td>500°C</td>
<td>4 µm</td>
<td>High compressive stresses</td>
<td>High</td>
<td>Low</td>
<td>No</td>
</tr>
<tr>
<td>CVD</td>
<td>Rough</td>
<td>1,000°C</td>
<td>10 – 15 µm</td>
<td>Tension</td>
<td>Low</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>HIPIIMS</td>
<td>Smooth</td>
<td>500°C</td>
<td>12 µm</td>
<td>Residual stress management for low compressive stresses</td>
<td>Very high</td>
<td>Yes</td>
<td>High (all materials, all substrates)</td>
</tr>
</tbody>
</table>