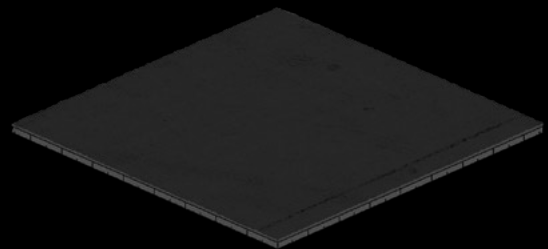
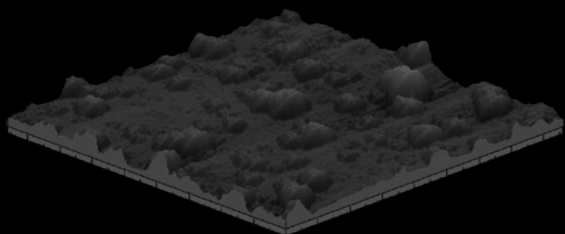


# COATINGS



# Cathode configurations

		<b>111</b> 2 × LARC® PLUS, TiCN option available		<b>411</b> 3 × LARC®, additional options available	
	Coatings	Option	Cathodes	Option	Cathodes
1	TiN	Standard	-, Ti	ECO SCIL	Ti, -, - LGD, -, -, Ti SCIL
2	TiCN	TiCN	-, Ti	ECO	Ti, -, -
3	TiAlN	Standard	Al, Ti	ECO TURBO	Ti, Al, - Ti, Al, -, AlTi33
4	TiAlCN			ECO	Ti, Al, -
5	AlTiN	Standard	Al, Ti	ECO TURBO	Ti, Al, - Ti, Al, -, AlTi33
6	CrN	Standard	-, Cr	ECO	Cr, -, -
7	CrTiN	Standard	Cr, Ti	ECO	Ti, -, Cr
8	TapCT			SCIL	LGD, -, -, CrTi50 SCIL
9	ZrN	Standard	Zr, Ti	ECO	Ti, -, Zr
10	AlCrN			LACS	-, -, Cr, AlCr30 SCIL
11	Omnis	Standard	Al, Cr	ECO ECO	Al, AlCr30, Cr AlCr35, AlCr35, AlCr35
12	AlTiCrN	Standard	AlCr30, Ti	ECO	Ti, Al, Cr
13	nACo	Standard	AlSi12, Ti	ECO TURBO	Ti, AlSi18, - Ti, AlSi18, -, AlTi33
14	nACRo	Standard	AlSi12, Cr	ECO TURBO	-, AlSi18, Cr -, AlSi18, Cr, AlTi33
15	TiXCo3	Standard	AlTi33, TiSi20	ECO TURBO	Ti, Al, TiSi20 Ti, Al, TiSi20, AlTi33
16	TiXCo4			TURBO	Ti, Al, TiSi20, AlCr30
17	PSiX			ECO	Ti, Al, TiSi20
18	BorAC			ECO ECO	Al, AlCrB20-10, Cr AlCr35, AlCrB20-10, AlCr35
19	TiBor			LACS	Ti, -, -, TiB2 SCIL
20	DLC1: TiCN + a-C:H:Me	TiCN	-, Ti	ECO	Ti, -, -
21	DLC2: TiN + a-C:H:Si			SCIL & DLC	LGD, -, -, Ti SCIL
22	DLC2: CrN + a-C:H(:Si)			DLC	-, -, Cr
23	DLC3: Cr + ta-C/a-C			LACS	-, -, Cr, C SCIL
24	nACoX			TURBO & OXI	Ti, AlSi18, AlCr45, AlTi33

Further coatings and cathode configurations on request

## 711

2 × Planar HiPIMS  
& PECVD mode

### Cathodes

Ti, Ti

Cr, Cr

Cr, Cr

## 1011

4 × Planar ARC,  
additional options available

### Cathodes

Ti, -, Ti, -

Ti, -, Ti, -

Ti, AlTi40, TiAl50, AlTi40

Ti, TiAl25, Ti, TiAl25

Ti, AlTi40, AlTi33, AlTi40

Cr, -, Cr, -

Ti, Cr, Ti, Cr

Ti, Zr, Ti, Zr

-, AlCr36, AlCr36, AlCr36

Cr, AlTi40, AlCr36, AlTi40

TiSi20, AlTi40, TiSi25, AlTi40

TiSi20, AlTi40, TiSi25, AlTi40

TiSi20, AlTi40, TiSi25, AlTi40

-, AlCr36, AlCrB20-10, AlCr36

Ti, -, Ti, -

-, Cr, -, Cr

# Coatings for cutting tools

			Turning	Milling			Gear cutting			
WORKPIECE MATERIAL			Inserts	Inserts	Shank tools	Micro tools	Hobs	Pinion cutting	Skiving	Fly cutters, stick blades
Steels	Dry	A	nACo	Omnis	Omnis	AlCrN	Omnis	Omnis	Omnis	TiXCo4
		B	AlTiN	BorAC	BorAC	-	BorAC	BorAC	BorAC	AlTiCrN
	Wet	A	nACo	AlTiCrN	AlTiCrN	AlCrN	Omnis	Omnis	Omnis	TiXCo4
		B	AlTiN	Omnis	Omnis	-	AlTiCrN	AlTiCrN	BorAC	AlTiCrN
Steels hardened < 55 HRC	Dry/Wet	A	TiXCo4	TiXCo4	TiXCo4	TiXCo3	-	-	TiXCo4	-
		B	nACo	nACo	nACo	-	-	-	BorAC	-
Steels hardened > 55 HRC	Dry	A	TiXCo3	TiXCo3	TiXCo3	TiXCo3	-	-	TiXCo4	-
		B	PSiX	PSiX	PSiX	-	-	-	PSiX	-
	Wet	A	PSiX	PSiX	PSiX	TiXCo3	-	-	TiXCo4	-
		B	nACo	nACo	nACo	-	-	-	PSiX	-
Stainless steel < 45 HRC	Dry	A	nACo	nACo	nACo	nACo	-	-	-	-
		B	AlTiN	AlTiN	AlTiN	-	-	-	-	-
	Wet	A	PSiX	PSiX	PSiX	nACo	-	-	-	-
		B	AlTiN	AlTiN	AlTiN	-	-	-	-	-
Stainless steel > 45 HRC	Dry	A	TiXCo3	TiXCo3	TiXCo3	TiXCo3	-	-	-	-
		B	nACo	PSiX	PSiX	-	-	-	-	-
	Wet	A	TiXCo3	TiXCo3	TiXCo3	TiXCo3	-	-	-	-
		B	TiAlCN	PSiX	PSiX	-	-	-	-	-
Superalloys Ni-based	Dry/Wet	A	nACoX	nACoX	PSiX	TiXCo3	-	-	-	-
		B	AlTiN	PSiX	TiXCo4	-	-	-	-	-
Superalloys Ti-based	Dry/Wet	A	nACo	nACo	nACo	nACo	-	-	-	-
		B	TiBor	TiBor	TiBor	TiBor	-	-	-	-
Cast iron	Dry/Wet	A	nACo	nACo	nACo	nACo	-	-	-	-
		B	AlTiN	AlTiN	AlTiN	-	-	-	-	-
Aluminium Si > 12%	Dry/Wet	A	nACRo	nACRo	nACRo	nACRo	-	-	-	-
		B	TiBor	TiBor	TiBor	TiBor	-	-	-	-
Aluminium Si < 12%	Dry/Wet	A	DLC3	DLC3	DLC3	DLC3	-	-	-	-
		B	TiBor	TiBor	TiBor	TiBor	-	-	-	-
Copper, bronze, brass	Dry/Wet	A	CrN	CrN	CrN	CrN	-	-	-	-
		B	DLC2	DLC2	DLC2	DLC2	-	-	-	-
Plastic	Dry/Wet	A	-	-	DLC3	-	-	-	-	-
		B	-	-	TiBor	-	-	-	-	-
Graphite	Dry	A	DLC3	DLC3	DLC3	DLC3	-	-	-	-
		B	-	-	-	-	-	-	-	-
	Wet	A	TiXCo4	TiXCo4	TiXCo4	TiXCo3	-	-	-	-
		B	DLC3	DLC3	DLC3	DLC3	-	-	-	-
Carbon fiber reinforced polymer	Dry/Wet	A	-	-	DLC3	DLC3	-	-	-	-
		B	-	-	TiXCo4	TiXCo3	-	-	-	-
Wood	Dry/Wet	A	-	DLC2	DLC2	-	-	-	-	-
		B	-	CrN	CrN	-	-	-	-	-

A primary recommendation    B secondary recommendation



# Coatings for chipless forming

		Fine-blanking	Punching	Injection molding		Forming, embossing	Deep drawing	Extrusion
TOOL MATERIAL				Plastic	Aluminum			
HSS	A	FeinAl Plus*	FeinAl Plus*	-	-	CrN	FeinAl*	nACRo
	B	FeinAl*	FeinAl*	-	-	TiBor	FeinAl Plus*	FeinAl*
Carbide	A	FeinAl Plus*	FeinAl Plus*	-	-	-	-	-
	B	FeinAl*	FeinAl*	-	-	-	-	-
Steels unalloyed	A	-	-	CrN	AlTiCrN	-	-	-
	B	-	-	TiN	nACRo	-	-	-
Steels hardened	A	FeinAl Plus*	FeinAl Plus*	CrN	AlTiCrN	CrN	FeinAl*	nACRo
	B	FeinAl*	FeinAl*	TiN	nACRo	TiBor	FeinAl Plus*	FeinAl*
Aluminum Si > 12%	A	-	-	CrN	-	CrN	-	-
	B	-	-	TiN	-	TiBor	-	-
Aluminum Si < 12%	A	-	-	-	-	CrN	-	-
	B	-	-	-	-	TiBor	-	-
Copper, bronze, brass	A	-	-	-	-	CrN	-	-
	B	-	-	-	-	TiBor	-	-

A primary recommendation  
B secondary recommendation

\* Trademark owned by Feintool Group

# Coatings for components

WORKPIECE MATERIAL		Machine parts <sup>1</sup>	Medical components <sup>2</sup>			Tribology	Decorative materials
			Medical implants	Surgical, dental instruments	Anti-bacterial medical components		
Steels unalloyed < 1000 N/mm <sup>2</sup>	A	-	-	-	-	DLC2	-
	B	-	-	-	-	DLC3	-
Steels unalloyed > 1000 N/mm <sup>2</sup>	A	-	-	-	-	DLC2	-
	B	-	-	-	-	DLC3	-
Steels hardened < 55 HRC	A	CrTiN	-	-	-	DLC2	-
	B	-	-	-	-	DLC3	-
Steels hardened > 55 HRC	A	CrTiN	-	-	-	DLC2	-
	B	-	-	-	-	DLC3	-
Stainless steel	A	-	-	DLC2	TiN-AB	DLC2	Custom
	B	-	-	DLC3	DLC-AB	DLC3	-
Stainless steel > 45 HRC	A	-	-	-	-	DLC2	Custom
	B	-	-	-	-	DLC3	-
Superalloys Ni-based	A	-	-	-	-	DLC2	-
Superalloys Ti-based	A	-	Ti2N	DLC3	-	DLC2	-
	B	-	ZrN	DLC2	-	-	-
Cast iron	A	CrN	-	-	-	-	-
Aluminum Si < 12%	A	CrN	-	-	-	-	-
Copper	A	-	-	-	TiN-AB	-	Custom
	B	-	-	-	DLC-AB	-	-
Bronze, brass	A	-	-	-	TiN-AB	-	Custom
	B	-	-	-	DLC-AB	-	-

A primary recommendation  
B secondary recommendation

<sup>1</sup>in abrasive and corrosive environment such as gears, water pumps, tool holders

<sup>2</sup>following PLATIT coatings are tested for biocompatibility and certified accordingly: AlTiN, CrN, DLC, TiCN, TiN, ZrN

# Coating properties

		Color	Nano-hardness [GPa] by Fisher Nanoindentor	Coating thickness [μm]	Coefficient of friction [μ] PoD (at RT, 50% humidity)	Max. service temperature [°C]
1	TiN	Gold	24–26	1–10	0.4	600
2	TiCN	Grey	36–38	1–3	0.25	450
3	TiAlN	Violet grey	36–38	1–5	0.5	700
4	TiAlCN	Red violet	34–36	1–5	0.25	450
5	AlTiN	Blue grey	36–38	1–5	0.6	900
6	CrN	Silver	21–23	1–10	0.5	700
7	CrTiN	Satin silver	28–30	1–10	0.4	700
8	TapCT	Silver	28–30	1–5	0.4	700
9	ZrN	White gold	21–23	1–5	0.4	550
10	AlCrN	Grey	36–38	1–5	0.6	900
11	Omnis	Grey/ Anthracite	33–35	0.3–6.0	0.5	1,100
12	AlTiCrN	Grey	36–38	1–5	0.5	900
13	nACo	Blue violet	39–41	1–4	0.5	1,200
14	nACRo	Grey	39–41	1–4	0.5	1,100
15	TiXCo3	Copper	42–44	1–4	0.4	1,100
16	TiXCo4	Grey	42–44	1–4	0.4	1,100
17	PSiX	Red brown	42–44	1–4	0.4	1,100
18	BorAC	Grey	38–40	1–5	0.5	900
19	TiBor	Satin silver	45	1–5	0.4	600
20	DLC1: TiCN + a-C:H:Me	Anthracite	36/20	1–3	0.1–0.2	400
21	DLC2: TiN + a-C:H:Si	Anthracite	> 25	1–3	0.1–0.2	400
22	DLC2: CrN + a-C:H:(Si)	Anthracite	> 25	1–3	0.1–0.2	400
23	DLC3: Cr + ta-C/a-C in Pi411	From rainbow colors to anthracite	45–50	0.3–1	0.1	450
24	nACoX	Dark grey	30–32	4–10	0.5	1,200

The given physical values may vary for different coating structures (mono-, gradient-, multi- and nanolayers).

If a coating can be deposited with ARC, SPUTTER and LACS® option, the properties of the ARC option are given.



# Signature and Dedicated Coatings

PLATIT's Signature Coatings are exclusively developed by our R&D teams using the unique features of the PLATIT technology. They combine years of experience and know-how in the field of coating development with the latest technical innovations.

Our Signature Coatings promise the highest performance for their dedicated applications in the field of cutting, forming and tribological components. PLATIT customers can differentiate themselves from competitors and stand out from the market standard with the deposition of Signature Coatings.

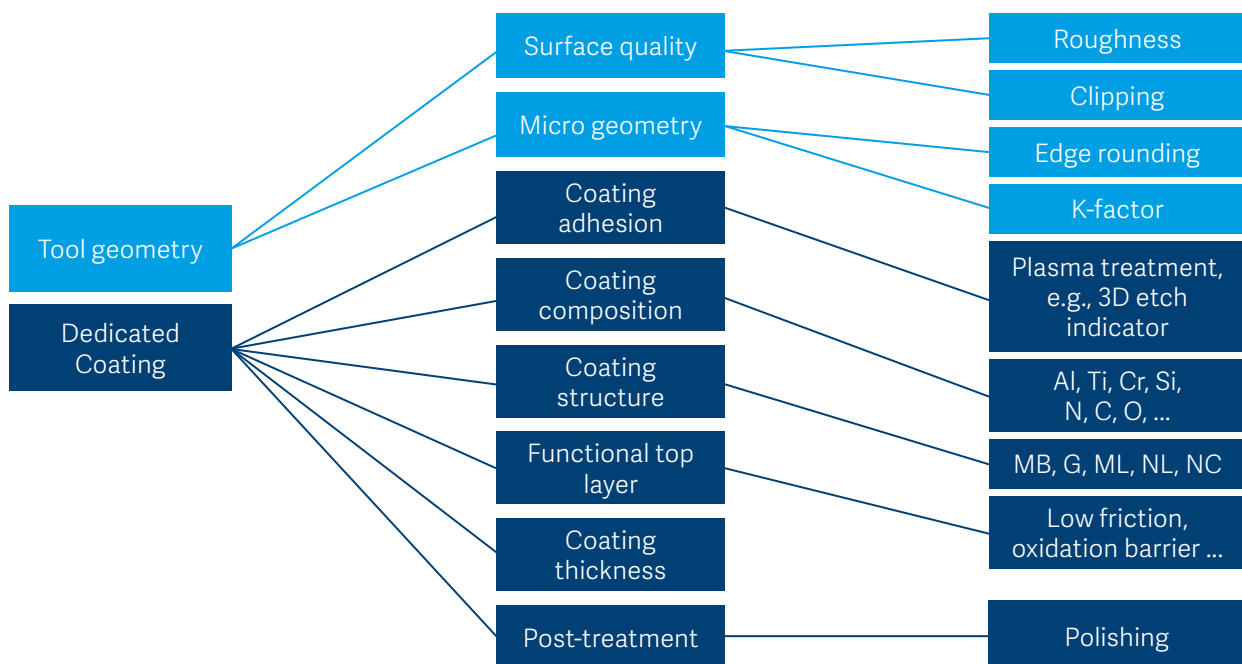
## Dedicated Coatings

Dedicated Coatings from PLATIT are tailored to individual needs of specific application and developed together with the customer for the customer. True to the open-source approach of PLATIT, the processes and recipes are open to engineers to enable innovations to accelerate.

Our Dedicated Coatings allow a variety of process parameters, configurations of the cathodes, their positions, deposition technology as well as pre- and post-treatments, depending on the adaption needs. These coatings are not limited to a certain application, going further from the field of cutting, forming and tribological components towards further industries and requirements.

## Development of new Dedicated Coatings

PLATIT's R&D team inspects the geometry of the tool and considers different parameters for the development of Dedicated Coatings.



# Signature Coating TiXCo

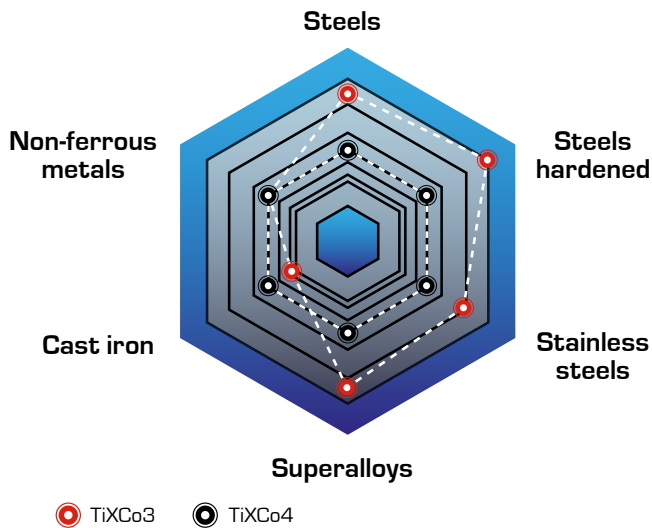
## TiXCo3 and TiXCo4

As our hardest nanocomposite, TiXCo3 is especially suitable for hard machining. It can be used at very high temperatures and is therefore suitable for finishing processes in milling, drilling and reaming. TiXCo4 is used for broadband applications.

### Highlights:

- TiXCo3:
  - High surface quality
  - Extremely hard and very wear-resistant
  - For super-hard machining
- TiXCo4:
  - Wide range of application and use

### Characteristics in cutting:

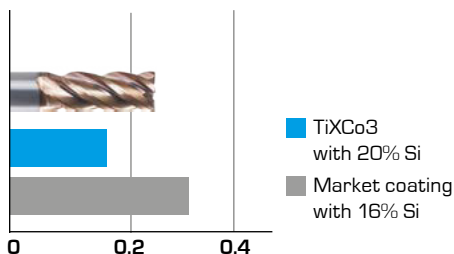


### Specifications

Color	copper with TiXCo3 grey with TiXCo4
Nano-hardness [GPa]	42–44
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.4
Coating thickness [μm]	1–4
Max. service temperature [°C]	1,100
Coating temperature [°C]	450–500
111 PLUS G3	TiXCo3 (AlTi33, TiSi20)
411 PLUS ECO	TiXCo3 (Ti, Al, TiSi20)
411 PLUS TURBO	TiXCo3 (Ti, Al, TiSi20, AlTi33) TiXCo4 (Ti, Al, TiSi20, AlCr30)
1011 G4	TiXCo3 (TiSi20, AlTi40, TiSi25, AlTi40)

### Milling in X210Cr13 with solid carbide end mill D6:

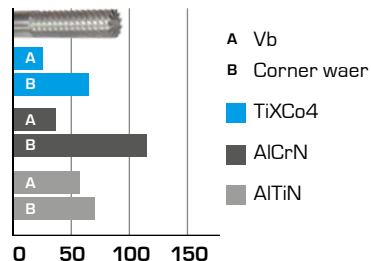
Wear Vb [μm]



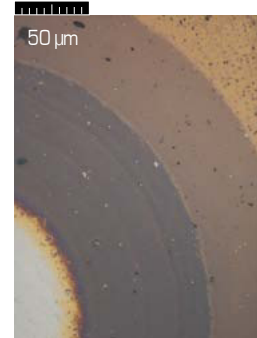
Tool: solid carbide end mill; D6  
Workpiece material: X210Cr13; 1.2080; 64 HRC  
Cooling: dry air, 5 bar; ap = 0.09 mm; ae = 0.06 mm;  
n = 16 820 rpm; f = 0.1 mm/rot  
Source: South Korean tool manufacturer

### Milling in SKD61 with solid carbide end mill D8:

Wear Vb [μm] after 27 m cutting length



Tool: solid carbide end mill; D8;  
cutting length = 27 m  
Workpiece material: SKD61; 54 HRC  
Cooling with emulsion; ap = 4 mm;  
ae = 0.03 mm; vc = 100 m/min  
Source: Chinese tool manufacturer



Calo 3 layers

TiXCo3: TiN → AlTi(Si)N → TiSiN  
TiXCo4: TiN → AlCrTi(Si)N → TiSiN

# Signature Coating PSiX

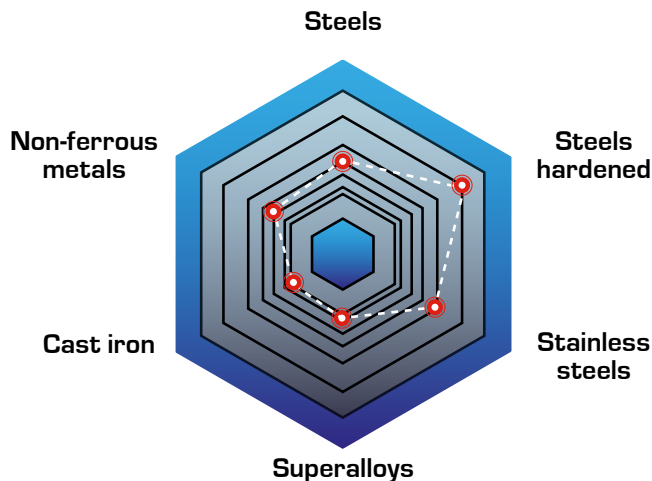
## Universal hard machining coating

PSiX is a new PLATIT nanocomposite coating with a super-hard top layer. PSiX is based on TiXCo3 but has a silicon-free AlTiN base. Therefore, the aluminum content of PSiX is higher, which increases the coating's thermal stability. The coating is temperature optimized and therefore excellent for hard machining processes like finishing and roughing.

### Highlights:

- Thermal stability
- Optimized service temperature
- Low coating residual stress

### Charakteristics in cutting:

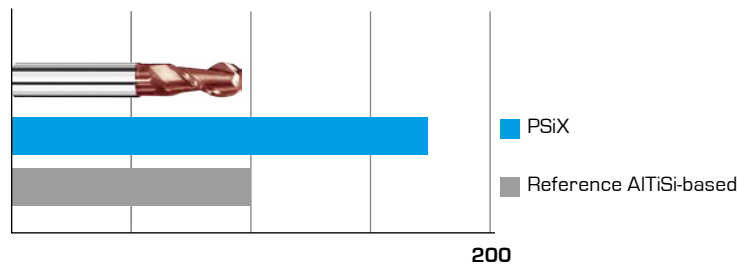


### Specifications

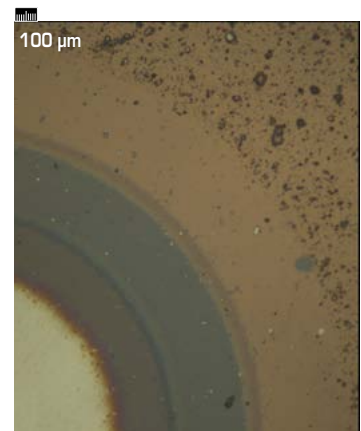
Color	red brown
Nano-hardness [GPa]	42–44
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.4
Coating thickness [μm]	1–4
Max. service temperature [°C]	1,100
Coating temperature [°C]	450–500
411 PLUS ECO	(Ti, Al, TiSi20)
1011 G4	(TiSi20, AlTi40, TiSi25, AlTi40)

### Ball nose end mill in 61 HRC:

Lifetime in % at VBmax = 200 m



Tool: ball nose end mill; D10  
 Workpiece material: 1.2379; 61 HRC  
 $a_p = 0.2 \text{ mm}$ ;  $a_e = 0.5 \text{ mm}$ ;  $v_c = 182 \text{ m/min}$ ;  $f_z = 0.14 \text{ mm}$   
 Source: GFE, Germany



### Calo 3 layers

Optional TiN adhesion layer →  
 AlTiN for reducing coating residual stress →  
 AlTiN for high hardness →  
 TiSiN nanocomposite top layer

# Signature Coating nACo

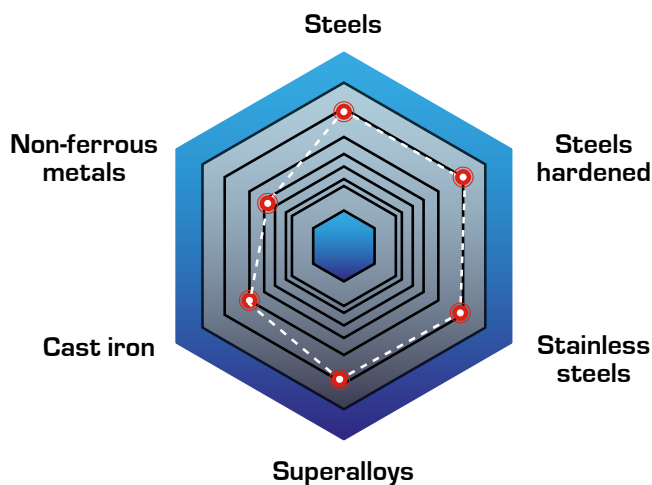
## Universal nanocomposite for milling and drilling C-steels

nACo is one of PLATIT's best-known coating brands. It has proven itself on the market for over 20 years. nACo is an AlTiSi-based nanocomposite coating and performs best in the field of milling and drilling C-steels. The use of nACo provides excellent adhesion and good performance even for more unusual applications such as milling with coated ceramic tools and CBN tools.

### Highlights:

- Nanocomposite with Si content
- High temperature stability
- Good hardness
- Reduces adhesion between cutting edges and work-piece
- Versatile application possibilities

### Characteristics in cutting:

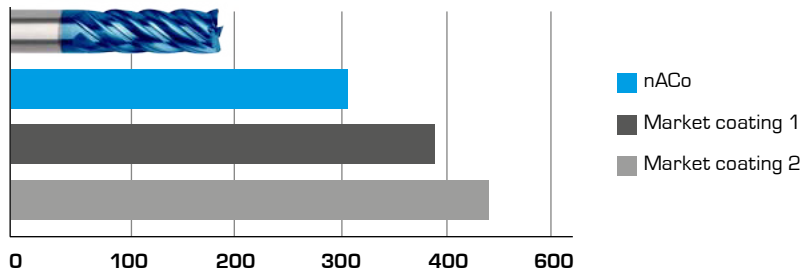


### Specifications

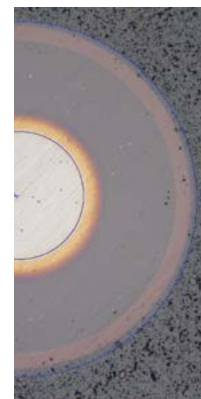
Color	blue violet
Nano-hardness [GPa]	39–41
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.4
Coating thickness [μm]	1–4
Max. service temperature [°C]	1,200
Coating temperature [°C]	400–500
111 PLUS G3	(AlSi12, Ti)
411 PLUS ECO	(Ti, AlSi18, -)
411 PLUS TURBO	(Ti, AlSi18, -, AlTi33)
1011 G4	(TiSi20, AlTi40, TiSi25, AlTi40)

### Milling in SUS316 with solid carbide end mill D4:

Wear Vb [μm] after 480 milling operations



Werkzeug: Vollhartmetall-Schaftfräser; D4; z = 4; Schnittlänge = 6 mm  
 Werkstückmaterial: SUS316  
 Kühlmittel; ap = 0,1 mm; ae = 4 mm; vc = 100 m/min; n = 8000 U/min; fz = 0,0625 mm/z;  
 f = 0,2500 mm/U; vf = 2000 mm/min  
 Quelle: Werkzeughersteller



### Calo 3 layers

AlTi(Si)N is deposited on a TiN adhesion layer

# Signature Coating nACRo

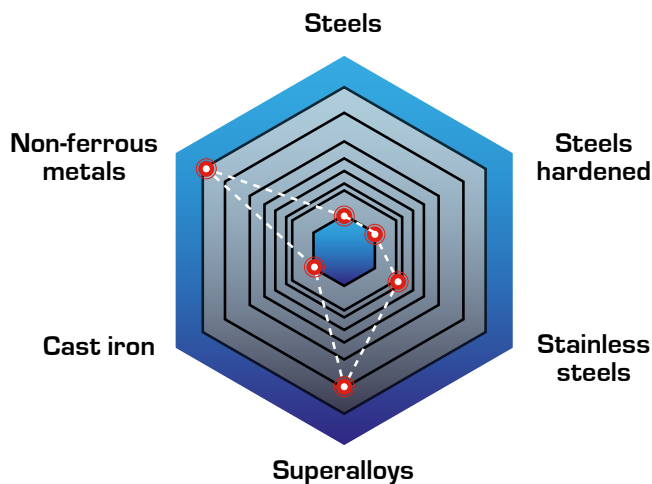
## Nanocomposite for non-ferrous materials

nACRo is PLATIT's nanocrystalline nanocomposite. Based on CrN adhesion layer, it has a AlTiCrN microcrystalline core layer for toughness and a AlCrSiN top layer which guarantees thermal stability and wear resistance. Also, nACRo can also be deposited on sharp cutting edges for machining wood, aluminum alloy with Si content > 12% and titanium alloys such as TiAl6V4. Furthermore, nACRo can be used for aluminum injection molding.

### Highlights:

- High resistance against temperature changes, oxidation and abrasive wear
- Specialist for machining abrasive aluminum alloys
- Usage also in chipless forming

### Charakteristics in cutting:

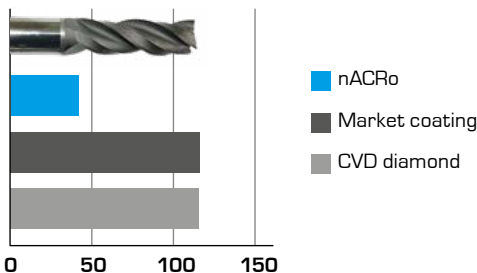


### Specifications

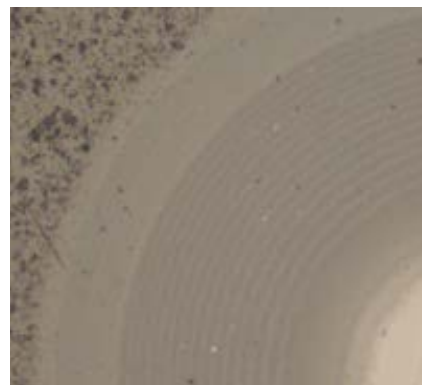
Color	grey
Nano-hardness [GPa]	39–41
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.5
Coating thickness [μm]	1–4
Max. service temperature [°C]	1,100
Coating temperature [°C]	450–500
111 PLUS G3	(AlSi12, Cr)
411 PLUS ECO	(-, AlSi18, Cr)
411 PLUS TURBO	(-, AlSi18, Cr, AlTi33)

### Milling in abrasive aluminum alloy:

Flank wear [μm]



Tool: solid carbide endmill; D8; z=3; cutting length = 25 mm  
 Workpiece material: EN AC 4700= <3.2583> AlSi12Cu  
 Coolant: emulsion  
 vc = 250 mm/min; n = rpm; ap = 5 mm; ae = 1 mm; fz = 0.16 mm/z  
 Source: GFE Schmalkalden



### Calo 3 layers

CrN adhesion layer →  
 AlTiCrN core layer →  
 AlCrSiN top layer

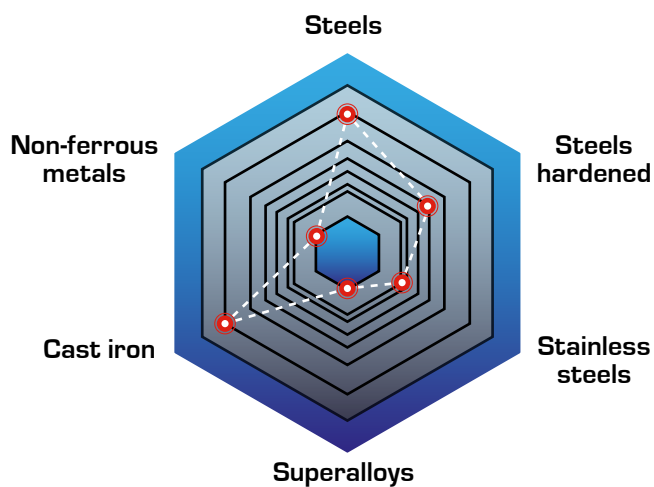
# Signature Coating Omnis

## Universal high-performance AlCrN-MB coating

Omnis is a universal high-quality coating developed for a wide range of applications for wet and dry machining:

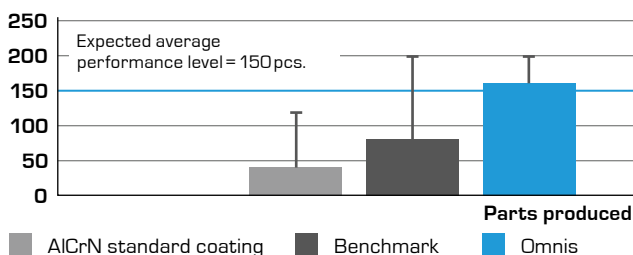
- Optimized coating properties (hardness, modulus, morphology) with advanced plasma parameters
- Higher productivity and deposition rate through increased process performance
- Advanced BIAS strategy for optimized residual stress distribution
- Use of multi-alloyed targets for maximum productivity

Characteristics in cutting:



With Omnis from PLATIT, variance between the tests is reduced:

Coating performance



Tool: Shaper cutter, Coating thickness: 3.5  $\mu\text{m}$   
 Workpiece material: 1.7131; 33 HRC  
 Wet machining  
 Source: Customer in Germany

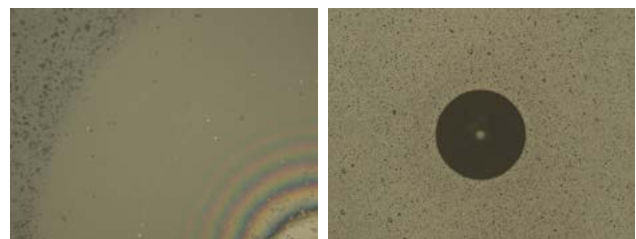
Highlights:

- Universal applicability e.g., for roughing, skiving, hobbing, finishing, forming, micro tools
- Omnis also works in applications typically covered by AlTiN and AlCrSiN coatings
- Superior and predictable wear behavior
- Fast and economical with extremely short batch times, e.g., for 2.0  $\mu\text{m}$  on endmill (3-fold rotation):
  - 4 h with Pi111 PLUS G3
  - 4–5 h with Pi411 PLUS ECO
  - 6–7 h with PL1011 G4
 or 4.0  $\mu\text{m}$  on hob (2-fold rotation):
  - 5–6 h with Pi111 PLUS G3
  - 5–7 h with Pi411 PLUS ECO
  - 7–8 h with PL1011 G4

Average cycle times in an ongoing production with max. number of cathodes in use.

### Specifications

Color	grey / anthracite
Nano-hardness [GPa]	33–35
Coefficient of friction [ $\mu$ ] PoD (at RT, 50% humidity)	0.5
Coating thickness [ $\mu\text{m}$ ]	0.3–6.0
Max. service temperature [ $^{\circ}\text{C}$ ]	1,100
Coating temperature [ $^{\circ}\text{C}$ ]	480
111 PLUS G3	(Al, Cr)
Pi411 PLUS ECO	(Al, AlCr30, Cr)
Pi411 PLUS ECO	(AlCr35, AlCr35, AlCr35)
1011 G4	(-, AlCr36, AlCr36, AlCr36)



Omnis

# Signature Coating BorAC

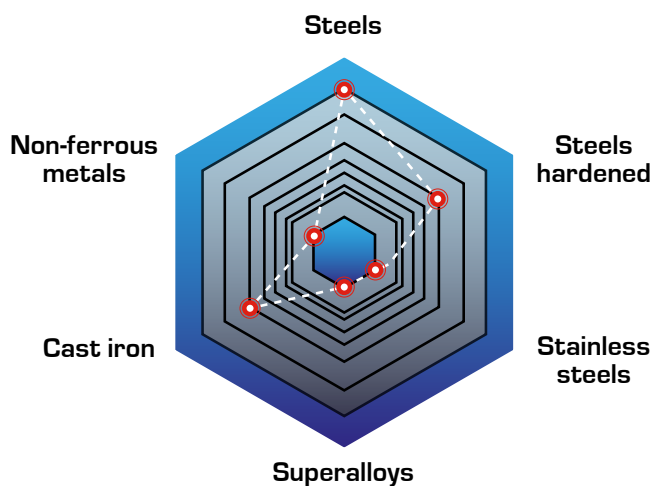
## Specialist for highly demanding machining

BorAC consists of a boron-doped AlCrN protective coating, which is especially suitable for crack inhibition and thus for high-speed applications such as transmission and gear cutting tools. BorAC delivers top performance under high loads, especially in gear hobbing and roughing (dry and wet). The coating can be deposited with PLATIT Pi411 PLUS ECO or Pi411 PLUS LACS® - with simultaneous ARC and SPUTTER processes.

### Highlights:

- Low coating residual stress
- Crack-resistant
- Minimizes crater wear
- Increases hardness and toughness

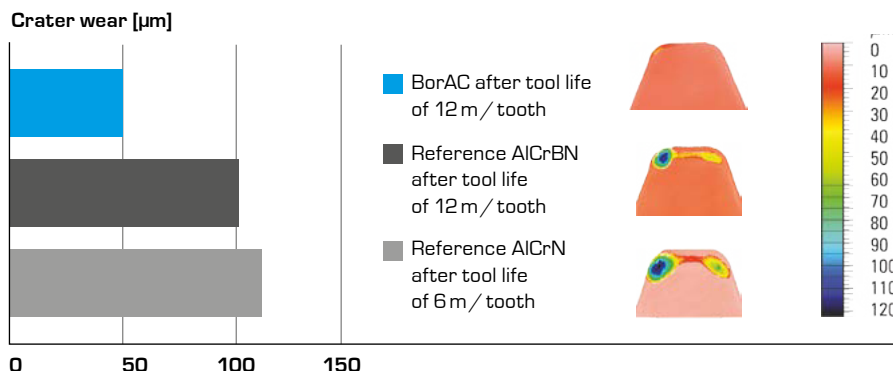
### Charakteristics in cutting:



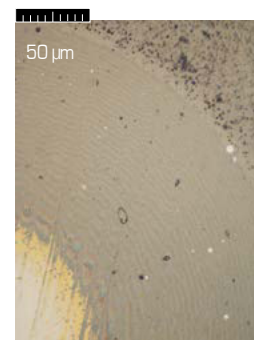
### Specifications

Color	grey
Nano-hardness [GPa]	38–40
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.5
Coating thickness [μm]	1–5
Max. service temperature [°C]	900
Coating temperature [°C]	400–500
411 PLUS ECO	(Al, AlCrB20-10, Cr)
411 PLUS ECO	(AlCr35, AlCrB20-10, AlCr35)
1011 G4	(-, AlCr36, AlCrB20-10, AlCr36)

### Effect of boron doping on crater wear in hobs:



Tool: HSS hob; D100  
 Workpiece material: 20 MnCr 5  
 Cooling air;  $m_n = 4 \text{ mm}$ ;  $v_c = 220 \text{ m/min}$ ;  $f_a = -6.4 \text{ mm/rot}$   
 Max. chip thickness  $h_{cu} = 0.24 \text{ mm}$   
 Source: IFQ Magdeburg



Calo 3 layers

CrN adhesion layer →  
 AlCrN →  
 AlCrBN

# Signature Coating TiBor

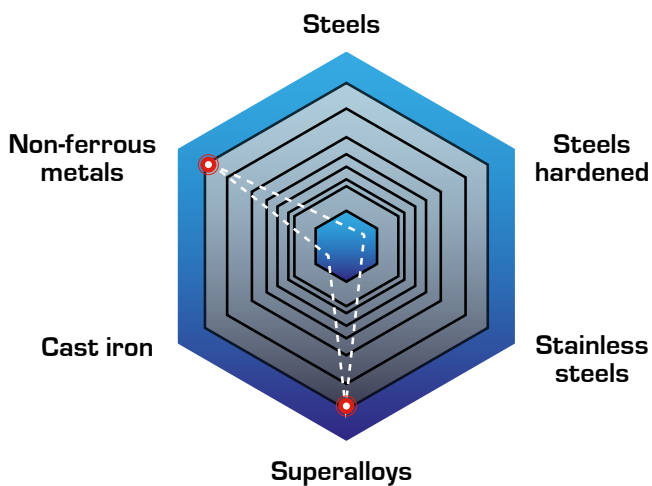
## LACS® coating for aluminum & titanium alloy machining

TiBor is one of the most efficient PLATIT LACS® coatings. The patented hybrid process of LARC® and central SPUTTERING SCIL® achieves a droplet-free surface which avoids built-up edges. Thus, the cutting edge will be sharp. TiBor performs very well in milling, drilling and reaming of aluminum, titanium and other non-ferrous metals like copper or brass.

### Highlights:

- Use for applications which favor build-up edge like Ti6Al4V (grade 5 / TC4) or aluminum
- Highly accurate coating for precise machining
- Increased wear-resistance

### Characteristics in cutting:

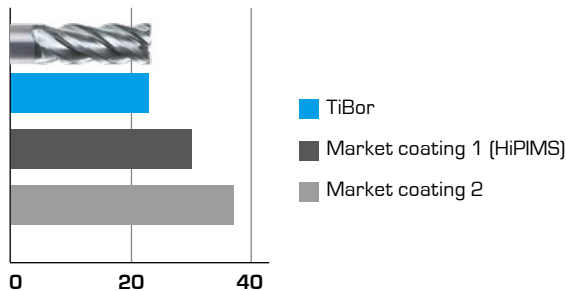


### Specifications

Color	satin silver
Nano-hardness [GPa]	45
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.4
Coating thickness [μm]	1–5
Max. service temperature [°C]	600
Coating temperature [°C]	200–400
411 PLUS LACS®	(Ti, -, -, TiB2 SCIL)

### Rough milling in Ti6Al4V (TC4):

Wear Vb [μm] after 10 h



Tool: end mill  
 Workpiece material: Ti6Al4V (TC4)  
 Spindle speed: 6500 rpm  
 Cutting speed vc: 1800 mm / min ap= 0.2 mm; ae=3.6 mm  
 Source: Chinese tool manufacturer



TiBor



# Signature Coating ta-C

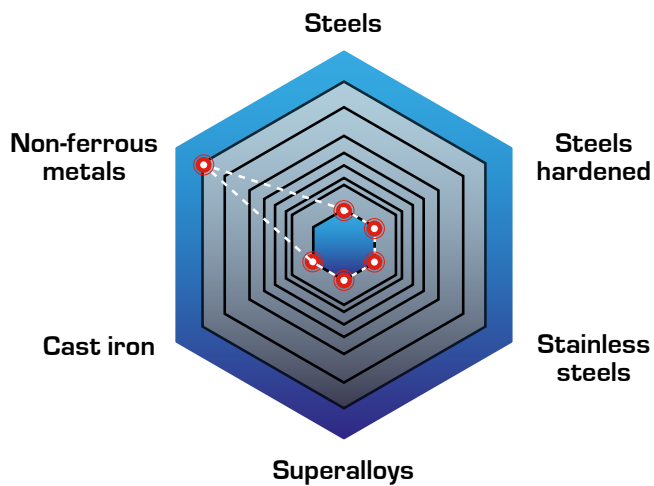
## Solution for graphite machining and for non-ferrous metals

ta-C belongs to the PLATIT DLC3 hydrogen-free coating generation with over 50% sp<sup>3</sup> content. The high sp<sup>3</sup> bond fraction results in a higher density, hardness (at ambient and elevated temperature), thermal stability, oxidation resistance, residual stress and lower thermal conductivity.

### Highlights:

- Over 50% sp<sup>3</sup> content
- High density and hardness
- Thermal stability
- Oxidation resistance
- Low chemical affinity
- Low thermal conductivity
- Low roughness
- Stable process and low maintenance intervals

### Charakteristics in cutting:



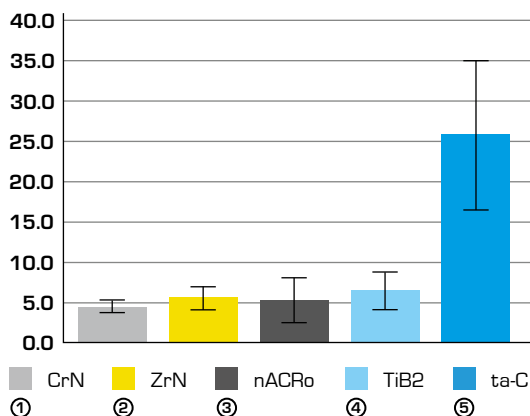
### Specifications

Color	From rainbow colors to anthracite
Nano-hardness [GPa]	35–55
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.1
Coating thickness [μm]	0.3–1
Max. service temperature [°C]	450
Coating temperature [°C]	< 100
411 PLUS LACS®	(-, -, Cr, C SCIL)

### Machining Al alloys with Si content to 10–14%:

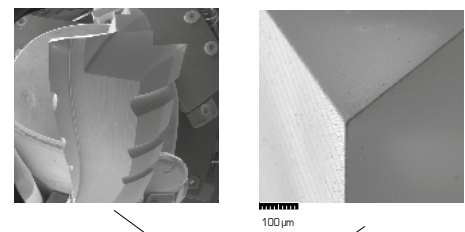
ta-C with Pi411 PLUS LACS® features higher performance and the least torque value measured

### Complex Performance CP



Tool: aluminum step drill; GIW/PCG  
Workpiece material: GD-AISI9Cu3(Fe); 9.3 % Si  
Source: PLATIT AG and PannonPLATIT, Budapest, HU

### DLC3 coated end mill under scanning electron microscope:



# Signature Coating nACoX

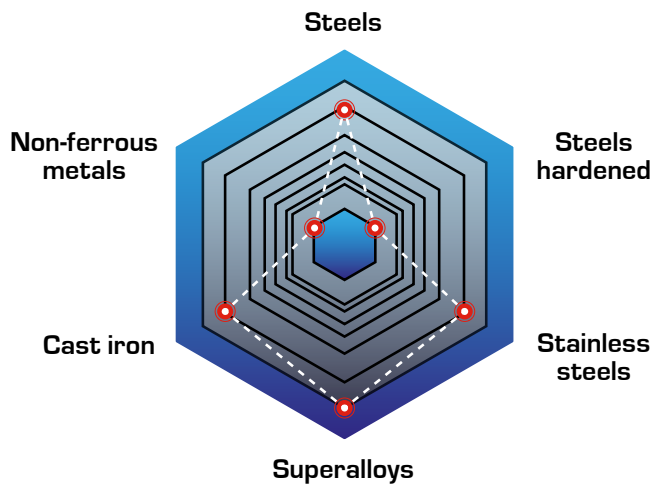
## Oxide nitride coating special for inserts

nACoX is the specialist for turning and milling with inserts under dry or MQL (Minimum Quantity Lubrication) conditions. Based on his four layers and thickness range, nACoX is comparable to CVD coatings while using lower coating temperature. By adding oxygen into the coating, nACoX has an improved oxidization resistance. It has a wide range of usage, beginning from milling cold work steel and ending with turning of Inconel 718.

### Highlights:

- Wear protection with chemical and thermal isolation, avoiding oxygen diffusion
- Decreasing friction at temperatures over 1,000 °C for reduction of build-up edges
- Sustainability by lower coating temperature than comparable CVD coatings

### Charakteristics in cutting:

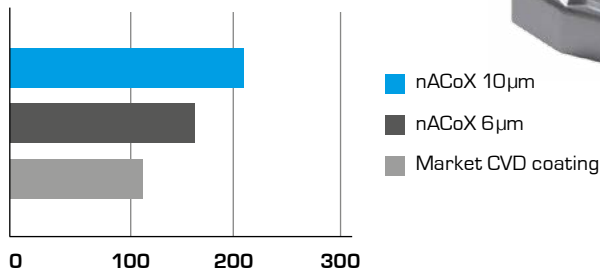


### Specifications

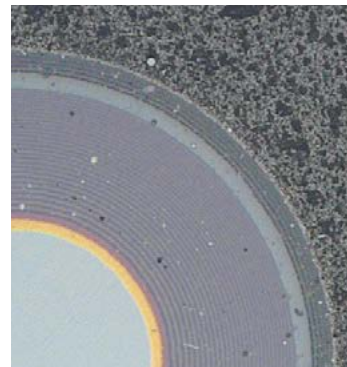
Color	dark grey
Nano-hardness [GPa]	30–32
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.5
Coating thickness [μm]	4–10
Max. service temperature [°C]	1,200
Coating temperature [°C]	550–600
411 PLUS TURBO & OXI	(Ti, AlSi18, AlCr45, AlTi33)

### Turning of ductile nickel alloyed steel:

#### Tool life [s]



Tool: Turning insert WNMG 080412  
 Workpiece material: Ni-steel  
 Coolant: MQL  
 vc = 110mm/min; f = 0.4mm; ap = 0.2 mm  
 Source: German automotive manufacturer



#### Calo 4 layers

TiN adhesion layer →  
 AlTiN core layer →  
 nACo core layer →  
 AlCrON top layer

# Signature Coating TapCT

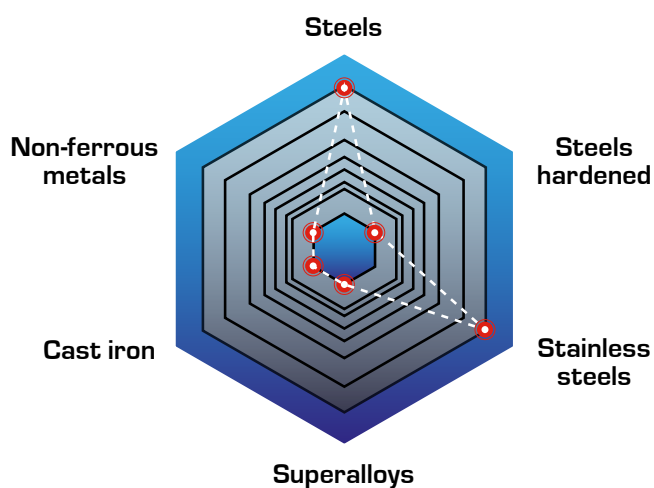
## SCIL® coating for tap forming

TapCT is characterised by a very smooth surface thanks to the SPUTTER process SCIL® (SPUTTERED Coating Induced by Lateral Glow Discharge). Thus, during tap forming, the friction between the tool and the workpiece material and the sticking of the material will be reduced, and the process reliability increased. Furthermore, the excellent coating adhesion will increase the performance.

### Highlights:

- High process reliability
- Lower machining torque
- High quality of the formed tap

### Charakteristics in forming:

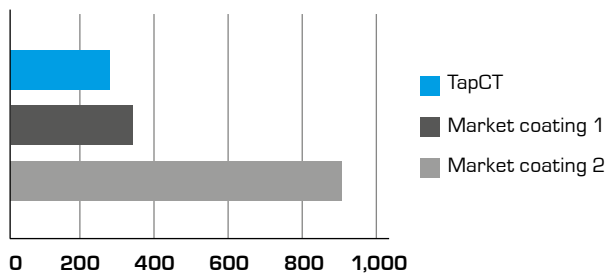


### Specifications

Color	silver
Nano-hardness [GPa]	28–30
Coefficient of friction [μ] PoD (at RT, 50% humidity)	0.4
Coating thickness [μm]	1–5
Max. service temperature [°C]	700
Coating temperature [°C]	400–450
411 PLUS SCIL	(LGD, -, -, CrTi50 SCIL)

### Tap forming in a carbon steel:

Torque after 2,000 holes [Ncm]



Tool: HSS forming tap M6x1  
 Workpiece material: carbon steel  
 Coolant: emulsion  
 vc = 20 mm/min; depth of the hole 9.0 mm  
 Source: Asia tool manufacturer



TapCT

# Dedicated Coating example

## FeinAI Plus

### The next generation of the dedicated coating for fineblanking applications

Longer tool life and higher tool efficiency: partner companies Blösch, Feintool and PLATIT release FeinAI Plus, a new generation of dedicated PVD coatings for fineblanking.

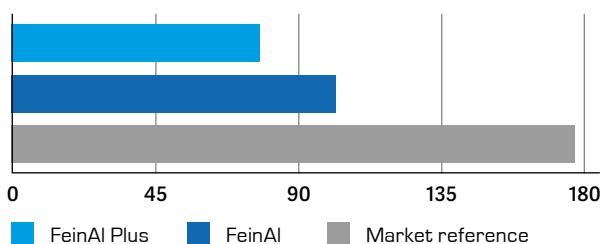
FeinAI set the market standard for PVD coatings of fineblanking tools over many years through its dedicated coating design and seamless integration in a process chain of customized pre- and post-treatment steps. Based on the proven concept of FeinAI and by adding several years of continuous development, the project partners announce the next level of coatings for fineblanking applications: **FeinAI Plus**

#### Numerous innovations lead to the unmatched tool performance of FeinAI Plus:

- Dedicated AlCr multilayer creating a tough and flexible coating structure
- Selective doping with boron, simultaneously reducing internal stress and increasing hardness
- Improved crack resistance and thus less chip welding inside the cracks
- Specialized edge rounding processes and post-polishing steps tailored to the substrate material, tool geometry, and coating design

#### Average wear comparison [ $\mu\text{m}$ ]:

Average measured wear on tools from four different test series after up to 30,000 strokes



Tool: Internal forming punch; high-speed steel S390; hardness of 66 HRC  
Coating thickness: 3.5  $\mu\text{m}$   
Punching material: quality C60E; thickness 3 mm; tensile strength 560 MPa  
Source: Feintool Technology AG

**BLOESCH**

Blösch specializes in the processing and finishing of surfaces.

**FEINTOOL**

Feintool is the leading manufacturer and expert in fineblanking.

**PLATIT**

PLATIT manufactures high-tech PVD and PECVD coating units for tools and components.

#### Specifications

Color	grey
Nano-hardness [GPa]	38–40
Coefficient of friction [ $\mu$ ] PoD (at RT, 50% humidity)	0.3
Coating thickness [ $\mu\text{m}$ ]	2.0–4.0
Max. service temperature [ $^{\circ}\text{C}$ ]	900
Coating temperature [ $^{\circ}\text{C}$ ]	400–500
Pi411 PLUS ECO	(Al, AlCrB20-10, Cr)
411 PLUS LACS <sup>®</sup>	(-, Al, Cr, TiB2 SCIL)





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