



PVD coatings | characteristics & applications



	TiN	TiCN	VARIANTIC	CrCN	ZrN	SUPRAL	EXX.cut 2.0 EXX.form 2.0	EXXTRAL silver	BLUE 2.0	SISTRAL	PLATINUM 2.0	WC/C	HardCUT HardCUT Micro	HiDrill
Material	Titanium Nitride	Titanium Carbon Nitride	Titanium Aluminium Carbon Nitride	Chromium Carbon Nitride	Zirconium Nitride	Titanium Aluminium Nitride	Aluminium Chromium Nitride	Aluminium Titanium Chromium Nitride	Aluminium Chromium	Aluminium Titanium Nitride with additives	Aluminium Titanium Nitride Zirconium Carbon Nitride	Tungsten Carbide Carbon	Aluminium Titanium Silicon	Aluminium Titanium Nitride
	TiN	TiCN (multi layers)	TiAlCN (multi layers)	CrCN	ZrN	TiAlN (multi layers)	AlCrN	AlTiCrN (stacked)	AlCr based	AlTiTXN - nano structure	Nano structure	a-C : Me	AlTiSi based nano composite	AlTiN based nano composite
Technology	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Micro hardness HV_{0.05}	2300 ± 300	3500 ± 500	3500 ± 500	2000 ± 200 2300 ± 200	2800 ± 300	3500 ± 500	3400	3000 ± 300	3400	3500 ± 500	3500 ± 500	1000 - 2200	3500	3500
Friction coefficient Against 100Cr6 steel	0.6	0.2	0.2	0.3 - 0.4 0.2 - 0.3	0.5	<0.5	0.3	0.4	0.3	0.7	0.7	0.2 - 0.25	0.5	0.6
Layer thickness [µm]¹	1 - 4	1 - 4	2 - 4	2 - 6	1 - 4	2 - 4	1 - 4	2 - 4	1 - 4	1 - 4	2 - 4	2 - 5	1 - 4	1 - 4
Maximum working temperature	500°C	400°C	800°C	600°C	600°C	800°C	1000°C	800°C	1000°C	900°C	900°C	400°C	> 1200°C	1200°C
Coating temperature	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	~ 450°C	350 - 450°C	~ 450°C	~ 450°C
Low-temperature method available	yes, 250-350°C			yes, 250 - 350°C								yes, 250 - 350°C		
Colour	Gold	Blue-grey (Anthracite)	Antique pink	Silver-grey	Light yellow	Black	Grey	Silver	blue-purple	Anthracite	Orange	Anthracite	Brown	Purple
Delivery time	2-3 WD	2-3 WD	2-3 WD	2-5 WD	2-3 WD	2-3 WD	2-3 WD	2-3 WD	2-5 WD	2-3 WD	2-5 WD	2-5 WD	2-5 WD	2-5 WD
General characteristics	All-round coating, bio-compatible	High degrees of hardness, excellent wear resistance, improved toughness	Low friction, high oxidation resistance	Low degrees of stress, high adhesive quality, high corrosion resistance	High degrees of hardness, pleasing colour, excellent corrosion & wear resistance, very smooth, bio-compatible	Universal multi layer coat. High degrees of hardness, high corrosion resistance, low friction	All-round high-performance coat. for use at extremely high temperatures. very high degree of hardness, excellent corrosion resistance & adhesive quality	High degrees of hardness & wear protection, excellent oxidation resistance, low friction coefficient	High degrees of hardness & wear protection, excellent adhesive quality & stability	High-performance coat. extremely high oxidation resistance, high red hardness & wear resistance	High-performance coat. Composite material consisting of Sistral and ZrCN, outstanding tribological properties	High gliding properties, low adhesive wear	High-performance coat. extremely high operating temperature & coating adhesion, extreme hardness & stability, minimal internal stress & crack formation	High-performance drilling. extremely high operating temperature & coating adhesion, extreme hardness & stability, excellent surface quality
Preferred applications	<ul style="list-style-type: none"> Processing and machining of iron-based materials Metal forming Plastic forming Decoration - visual refinement Medical technology Food industry 	<ul style="list-style-type: none"> Machining of hard to machine steel alloys High-performance machining – where moderate temperatures occur on the cutting edges Excellent for metal forming (e.g. of stainless steel) 	<ul style="list-style-type: none"> All steel grades at dry lubricated, MQL or wet machining conditions Excellent for drilling into steel Milling Drawing, punching, pressing and forming tools for the machining of high and low alloy steels 	<ul style="list-style-type: none"> Metal forming Plastic machining (improved demoulding) Aluminium and magnesium pressure die-casting Machining of non-ferrous metals 	<ul style="list-style-type: none"> Machining of Al alloys & non-ferrous metals Machining of aluminium with an Si content of <10% Machining of titanium Machining of fibreglass, nylon & polymer materials Medical applications Reduced galling 	<ul style="list-style-type: none"> Excellent for die-cast machining Drilling (at poor cooling, without interior cooling) Very well suited for drilling & milling of steels up to 54 HRC 	<ul style="list-style-type: none"> General high-performance machining Universal application from 35 to >54 HRC Milling, drilling Punching & forming Cutting Dry machining Stainless steel Titanium, super alloys Die-cast, Al pressure die-cast 	<ul style="list-style-type: none"> Machining of Al alloys & non-ferrous metals Machining of abrasive materials and materials that tend to agglutinate (stainless steel, Si-rich Al alloys, grey cast) Machining of aluminium with an Si content of >10% Universal application in milling, drilling High-performance machining, MQL or dry machining ALU & magnesium injection moulding Very well suited for indexable inserts 	<ul style="list-style-type: none"> Resistant all-round coat in interference colours New high-performance coat for multiple applications Machining of steels 35 to >54 HRC Stainless steel 	<ul style="list-style-type: none"> Milling under extreme conditions Dry high-speed machining High-performance machining of highly abrasive or hard materials (steel >54 to >62 HRC) Stainless steel Non-corrosive steels Suited for die punches and indexable inserts 	<ul style="list-style-type: none"> Machining under extreme conditions High-performance machining of highly abrasive materials Inconel machining Very well suited for indexable inserts 	<ul style="list-style-type: none"> Precision components Punching, forming, MQL or dry machining Plastic injection moulding Very well suited for parts gliding against each other (e.g. slides) For the machining of galvanised sheet metal 	<ul style="list-style-type: none"> High-performance machining Hard milling Hardened steels 54 HRC to >66 HRC Also available as HardCUT micro for micro tools with $\alpha < 3 \text{ mm}$ 	<ul style="list-style-type: none"> High-performance drilling Drilling of steels >54HRC Aluminium with an Si content of >12% Milling of cast iron
	*Duplex possible		*Duplex possible				NEW! *Duplex possible		NEW!		NEW!		NEW!	NEW!

1) depending on tool size, for micro tools, even smaller than 2µm



PVD coatings

application recommendation

by material groups

for machining



	Non-alloyed steels Steels < 35 HRC	Steels 35 to 54 HRC	Cast iron	High-alloyed steels Steels < 54 HRC	Hard milling up to > 66 HRC	Rustproof steels / stainless steel	Titanium	Super alloys	Non-ferrous metals (copper, zinc, bronze, brass)	Inconel	Aluminium with Si content < 10%	Aluminium with Si content > 10%
1.	SUPRAL [b,f]	SUPRAL [b,f]	SUPRAL [b]	SISTRAL [f]	HardCUT [f]	EXX.cut 2.0 [f,b]	ZrN [f]	EXX.cut 2.0 [f,b]	ZrN [f]	PLATINUM 2.0 [f]	ZrN [f,b]	EXX.silver [f,b]
2.	VARIANTIC [b,f]	EXX.cut 2.0 [f,b]	HiDrill [f]	HiDrill [b]	SISTRAL [f]	EXX.silver [f,b]	EXX.cut 2.0 [f,b]		EXX.silver [f,b]	EXX.cut 2.0 [b]		HiDrill [b,f]
3.	EXX.cut 2.0 [f,b]	VARIANTIC [b,f]	EXX.cut 2.0 [f,b]	EXX.cut 2.0 [f]		SISTRAL [f]						
4.			EXX.silver [f]									

Focus: [b] ... drilling
[f] ... milling

Pos.1: Main recommendation
Pos. 2 & 3: Alternatives