HARTNER

Coatings

Short description

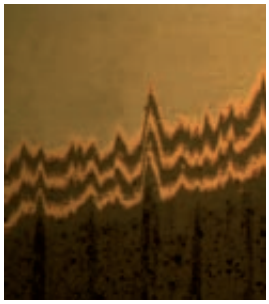
	T	A	A	C	DLC	F	Diamond
	TiN-coat	TiAlN-coat	AlTiN / AlTiN nano-coat	TiCN-coat	DLC-coat	FIRE-coat	Diamond-coat
process	PVD	PVD	PVD	PVD	PVD	PVD	CVD
coating temperature max. (°C)	400° – 500°	400° – 500°	400° – 500°	400° – 500°	< 150°	400° – 500°	> 700°
substrate	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels, carbide, cermet	carbide, cermet, HSS	high speed steels, carbide, cermet	carbide, cermet
layers	single-layer	single-layer	single-layer or nano-layer	single-layer	single-layer	multi-layer (6)	single-layer
colour	golden	greyish-purple, blue-violet	anthracite blue	grey	black	purple or blue-violet	grey-black
hardness (HV 0,05)	2200	3300	3400	3000	> 6000	3000	> 8000
application temperature (°C)	< 600°	< 800°	< 900°	< 450°	< 500°	< 800°	< 600°
heat transfer (kW/mK)	0,07	0,05	0,05	0,1	0,01	0,05	> 0,1
type of machining	universal	turning, drilling	universal	milling, drilling, thread cutting	drilling, reaming thread cutting	drilling, milling, thread cutting	turning, drilling, milling
preferred machinable materials	universal	steel, cast iron	stainless steel, hardened steels, nickel-based alloys	steel, high-tensile materials, Inconel, Monel	wrought aluminium alloys, die-cast aluminium up to 12% Si content, non-ferrous metals	universal	Diamond C: graphite Diamond F: fibre reinforced plastics Diamond M: AlSi, MMC
characteristics	cost effective	temperature-resistant	HSC machining, hard machining applications	insensitive against shock stress	minimises the tendency for residues to build up	universal	for highly abrasive materials

Comparison layer structure

single-layer

Example
TiAlN-coat

multi-layer



Example
FIRE-coat

Short description

	Ⓜ	TiAlZrN	AlTiZrN	Ⓨ	TiSiN	ZrN
	MolyGlide-coat	TiAlZrN-coat	AlTiZrN-coat	TiAlSiN-coat	TiSiN-coat	ZrN-coat
process	PVD	PVD	PVD	PVD	PVD	PVD
coating temperature max. (°C)	100° – 150°	400° – 500°	400° – 500°	400° – 500°	450° – 500°	400° – 500°
substrate	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels (tapping), carbide, cermet	high speed steels, carbide, cermet
layers	single-layer	multi-layer (7)	nano-layer	multi-layer, nanocomposite	multi-layer, nanocomposite	multi-layer
colour	grey-green	pale golden	pale golden	bronze	copper	pale golden
hardness (HV 0,05)	20 – 50	3300	3400	5500	4000	2500
application temperature (°C)	< 800°	< 800°	< 800°	< 800°	< 800°	< 700°
heat transfer (kW/mK)	< 0,1	0,05	0,05	0,03	0,03	0,04
type of machining	drilling, reaming, milling, thread cutting	drilling, milling, thread cutting	drilling, thread cutting	drilling, milling, reaming	drilling, milling, reaming	drilling, milling, Dekor
preferred machinable materials	Al, AlSi, steel, special alloys	universal	stainless steel, nickel-based alloys	universal, especially cast iron, hardened steels, high-tensile steels, CFK	universal, especially C-steels, free-cutting steels, Mn-steels, heat-resistant steels	titanium, aluminium, nickel-based alloys, stainless steel
characteristics	reduction in friction and dry machining	improved chip evacuation	low friction	highly hard, universal	low adhesion tendency	low adhesion tendency

Surface refining processes

bright

Due to their basically good properties, high speed steel and carbide tools are supplied without being surface treated, i.e. in a bright finish.

Surface refining processes
For special applications it is desirable to increase the durability and to reduce the sliding resistance and tendency of cold welding by special surface refining processes. The following refining processes continue to be of less importance. Generally, much better results are achieved with hard or soft coated tools.

steam nitrided
nitrided lands

Nitriding is a further means of increasing the durability of tools. This finish is recommended for the machining of grey cast iron, aluminium with a high silicon content, plastics, steels with a high perlite content etc.. Our tools are nitrided using different application orientated processes.

steam tempered

Steam tempered tools also offer a reduction in sliding resis-tance. Thus cold welding which occurs for example during the machining of steels that have a low carbon content, can be avoided most economically. Steam tempered tools are only suitable for ferrous materials.

Hartner coatings

A-coat or TiAlN-coat (titanium aluminium nitride)

Coating colour: violet
The monolayer TiAlN coating is suited for abrasive operations with carbide tools because of its high hardness and chemical resistance, e.g. hard machining and high speed cutting (HSC).

Super A-coat or AlTiN-coat (aluminium titanium nitride)
nanoA-coat or AlTiN nano-coat (aluminium titanium nitride)

Coating colour: grey-violet
The well established A-coating has been developed at Hartner. By optimizing the structural, chemical and mechanical properties of the new Super-A coating an extremely high hot hardness, very good oxidation resistance and excellent coating adhesion have been achieved. This coating is used exclusively on carbide cutting tools and is ideally suited for difficult-to-machine aerospace materials such as titanium alloys, Inconel as well as machining hardened steel materials (>52 HRC) and HSC applications.

C-coat or TiCN-coat (titanium carbon nitride)

Coating colour: grey
End mills and taps exposed to high mechanical load are coated with TiCN. With respect to the high hardness and toughness of TiCN coating the tools offer good machining results operating with interrupted cutting.

F-coat or FIRE/nanoFIRE

Coating colour: violet
This TiAlN/TiN multilayer coating is applied to HSS and carbide drills. It offers outstanding wear resistance in drilling operations and high heat resistance. Besides conventional wet applications this coating is suitable for minimum lubrication and dry machining, often combined with MolyGlide to optimize the running-in wear and improved resistance to galling.

T-coat or TiN-coat (titanium nitride)

Coating colour: yellow-golden
The monolayer Titanium Nitride coating is standard for HSS and carbide tools. Used for drilling, tapping and milling operations. Nevertheless, most application is steel machining.

M-coat or MolyGlide®-coat on MoS_2-basis

Coating colour: light grey
MolyGlide is a thin, friction minimizing coating for applications requiring a minimum friction coefficient, e.g. dry or minimum quantity lubrication (MQL) machining. Moreover, this coating offers resistance to galling, when minimum lubrication fails.

Surface refining processes

Y-coat or TiAlSiN-coat

Coating colour: bronze
This multilayer, ultra hard and heat-resistant coating is especially designated for the machining of high-tensile steels as well as hardened steels and cast iron.

AlTiZrN-coat

Coating colour: pale golden
Especially suitable for the machining of stainless steel at high demand on chip evacuation, but also for nickel-based alloys.

TiSiN-coat

Coating colour: copper red
Highly heat-resistant nanocomposite coating for the machining of carbon steels, free-cutting steels and steels with manganese content. Reduces adhesive wear. Furthermore very well suitable for the machining of highly heat-resistant steels. Limited to the use for solid carbide drills and end mills.

ZrN-coat

Coating colour: pale golden
This multi-layer coating is specifically designed for the machining of titanium, softer nickel-based alloys and firmer aluminium wrought alloys and aluminium casting alloys up to a content of 12% silicon. Minimises the occurrence of build-up on the cutting edges and a good chip evacuation is safeguarded.

DLC-coat

Coating colour: black
This highly hard carbon coating (DLC-diamond-like-carbon) reduces the occurrence of build-up on the cutting edges during the machining of highly adhesive wrought aluminium alloys/aluminium casting alloys and thus, allows for a precise dimensional control and good surface texture on the workpiece.

Diamond-coat

Coating colour: grey-black
Highly hard diamond coating for the machining of graphite, fibre reinforced plastics and aluminium casting alloys with more than 12% silicon contents. Extremely high resistance to wear goes together with very marginal build-up on the cutting edges.

TiAlZrN-coat

Coating colour: pale golden
Continued development of the FIRE-coat for the machining of general steels. Its main field of application is wherever the suitability of the FIRE-coat is limited due to problems in chip evacuation.