

# INSERT SELECTION GUIDE

## MATERIALS

### UNCOATED CARBIDE

Tungsten carbide based material with a cobalt binder is offered in two industry-class grades.

**C-2 GRADE** for general-purpose machining of aluminum, cast iron and nonferrous metals as well as high temperature alloys and plastics.

**C-5/C-6 GRADE** for general-purpose machining of steel, cast steels and 400 series stainless steels. For materials that are very difficult to machine, carbide is now being replaced by the coatings, ceramics and super hard materials listed below.

### COATED CARBIDE

**TiN COATED (Titanium Nitride)** gold in color and is a combination light roughing and finishing grade. The TiN coating has both high wear resistance and heat resistance for machining alloys and stainless steels as well as ductile irons.

**TRI COATED (TiN-AIO<sub>x</sub>-TiN)** gold in color and is recommended for low speed, high feed and unfavorable conditions. The triple coating is suited for heavy-duty turning and milling of cast steel, stainless steel and alloys with interruptions and rough surface conditions.

**TiC COATED (Titanium Carbide)** abrasive, flank and nose wear resistance used in applications where abrasive wear is the primary failure mode in cast iron, steel and alloyed steel.

### CERMET

Cermet is a carbide blend, solid (100% titanium) carbide with a nickel binder. Cermet grades are based on TiCN with superior hardness and excellent high temperature compared to conventional carbides. Specific grades for machining carbon and alloy steels, stainless steels and cast iron where tool life and improved workpiece finish is desired.

### CERAMIC

Ceramic inserts should be considered when machining cast irons and high hardness materials above Rc 35. Various grades are available for nickel-base alloys and a for cast iron and can be machined at higher speeds than conventional carbides. Ceramic inserts have superior edge strength.

## In Carbide Inserts

<b>Carbide Blanks</b> .....	<b>296</b>
<b>Carbide Inserts</b> .....	<b>257-292</b>
<b>Ceramic Inserts</b> .....	<b>294</b>
<b>Cermet Inserts</b> .....	<b>293</b>
<b>Grooving Inserts</b> .....	<b>328-336</b>
<b>PCD (Diamond) Inserts</b> .....	<b>296</b>
<b>Threading Inserts</b> .....	<b>337-342</b>

### PCD (POLYCRYSTALLINE DIAMOND)

Polycrystalline diamond inserts provide premium performance when cutting highly abrasive, low tensile strength, nonferrous, nonmetallic and aluminum composite work materials. The exceptionally hard, wear resistant diamond cutting tip will remain sharp even in demanding applications, running up to 7500 SFM and beyond. As a result PCD tipped tools provide up to 100 times the tool life of carbide.

### PCBN (POLYCRYSTALLINE CUBIC BORON NITRIDE)

Cubic boron nitride tipped inserts are designed to machine ferrous materials in the Rc 40 to Rc 70 range. PCBN is significantly harder than carbides and ceramic inserts and is the only material that combines a high degree of toughness with exceptional hot hardness. Best for hard steels, chilled and gray cast irons.

## INSERT GRADE APPLICATION GUIDE

	CATEGORY	ACTUAL MATERIALS	RECOMMENDED GRADE
STEELS	FREE MACHINING & LOW CARBON STEELS	1006, 1008, 1010, 1015, 1018, 1020, 1022, 1025, 1117, 1141, 1213, 12L13, 12L14, 11L41	<b>VALENITE</b> <b>SV230</b> (TiC/TiN) SEVERE ROUGHING Medium Carbon and Alloy Steels, Tool and Die Steels, Stainless Steel. <b>SV235</b> (TiC/TiN) HEAVY ROUGHING Medium Carbon and Alloys, Tool Steel. <b>SV310</b> (TiC/AIO <sub>2</sub> /TiN) HIGH SPEED FINISHING Steel and Stainless Steel. <b>SV315</b> (TiC/AIO <sub>2</sub> /TiN) LIGHT ROUGHING TO HIGH SPEED FINISHING Steel, Stainless and High Temp Alloys. <b>SV325</b> (TiC/AIO <sub>2</sub> /TiN) GENERAL-PURPOSE ROUGHING & FINISHING Carbon Steel, Alloys and Stainless Steels.
	MEDIUM CARBON & HIGH CARBON STEELS	10930, 1035, 1040, 1045, 1052, 1055, 1600, 1085, 1095, 1424, 1541, 1551	<b>SM225</b> (TiC/TiN) LIGHT ROUGHING TO FINISHING Carbon Steels, Alloy Steels, Stainless Steel. <b>SM245</b> (TiC/TiN) ROUGHING TO FINISHING Carbon Steels, Alloy Steels, Stainless Steel.
	ALLOY STEELS & EASY TO MACHINE TOOL STEELS	4130, 4140, 4150, 4340, 5140, 4320, 5120, 8620, 6150, 52100, W1, W2, 300M	<b>V1N</b> (TiN) SEVERE ROUGHING & INTERRUPTED CUTS Steels, High Temp Alloys, Stainless. <b>VP5515</b> (TiCN/AI2O3/TiN) ENHANCED WEAR RESISTANCE Steels, Carbon, Alloys; Tool & Die. High Speed Finishing Grade. <b>VP5525</b> (TiCN/AI2O3/TiN) GENERAL-PURPOSE ENHANCED WEAR RESISTANCE Steels & Stainless. <b>VP8535</b> (TiCN/AI2O3/TiN) ROUGHING ENHANCED WEAR RESISTANCE Stainless Steel & High Temp Alloys. <b>VP5020</b> (PVD TiAlN) FINISHING & SEMI FINISHING Steels, Stainless Steels, Cast Iron & Aluminum Alloys. <b>VP5040</b> (PVD TiAlN) GENERAL MACHINING & ROUGHING Steels & High Temp Alloys. <b>VP5135</b> (TiN/TiCN CVD) ROUGH MILLING Steels & Stainless Steel. <b>VP5142</b> (MTCVD) ROUGHING TO FINISHING APPLICATIONS on Carbon and Alloy Steels & Stainless Steel. <b>VP7615</b> (PVD TiAlN/TiN) LIGHT MACHINING Steels, Stainless Steel & High Temp Alloys.
	TOOL STEELS & DIE STEELS	M1, M2, T1, T4, T15, A2, A3, D2, D4, O1, O2, H10, H11, P2, P20	<b>IC50</b> (C5) ROUGHING, HIGH FEEDS & INTERRUPTED CUTS Carbon Steels, Alloy Steels. <b>IC328</b> (PVD) ROUGHING, INTERRUPTED CUT, LOW SPEED/HIGH FEED Carbon Steel, Alloy Steel, Stainless Steel. <b>IC635</b> (CVD) LOW SPEED/HIGH FEED IN UNFAVORABLE CONDITIONS Carbon Steel, Alloy Steel, Stainless Steel. <b>IC9025</b> (CVD) ROUGHING & SEMI-FINISHING AT MEDIUM SPEEDS Low Carbon, Low Alloy Steel, Stainless Steel.
			<b>NEWCOMER</b> <b>N60</b> (C50) ROUGHING, HIGH FEEDS & INTERRUPTED CUTS Steel, Steel Alloys, Stainless. <b>NN60</b> (TiN) GENERAL-PURPOSE TO LIGHT ROUGHING AND FINISHING Steel, Steel Alloys, Stainless. <b>NK533</b> (AO/TiN) ROUGHING AND FINISHING AT HIGH SFM (350-800) Carbon Steel, Alloy Steel. <b>NK620</b> (AO/TiN) ROUGHING AND FINISHING AT HIGH SFM (450-1000) Carbon Steel, Cast Steel, Hardened Steel. <b>NK710</b> (AO/TiN) FINISHING AT HIGH SFM (550-1200) Carbon Steel, Cast Steel, Hardened Steel.
			<b>PRESTIGE</b> <b>C6</b> (UNCOATED) SEMI-FINISHING TO LIGHT ROUGHING Carbon Steel, Cast Steel. <b>TiN</b> (COATED) GENERAL-PURPOSE WITH INCREASED SPEEDS Carbon Steel, Cast Steel, Steel Alloys. <b>LT10</b> (PVD) Turning. <b>LT30</b> (PVD) Milling.
			<b>ALLIED</b> <b>CM40</b> (PVD/TiAlN) COATED FINISHING TO Medium Machining Carbon, Alloy Steels & Stainless Steel.

# INSERT SELECTION GUIDE

## INSERT GRADE SELECTION GUIDE (continued)

CATEGORY	ACTUAL MATERIALS	RECOMMENDED GRADE	
FERRITIC & MARTENSITIC STAINLESS STEEL	403, 405, 409, 410, 410S, 414, 430, 431, 434, 440, 442	<b>VC2</b> <b>VC929</b>	<b>VALENITE</b> (UNCOATED) GENERAL-PURPOSE Stainless Steel. (PVD) GENERAL-PURPOSE ROUGHING & HIGH SPEED FINISHING Nickel-base Alloys, Inconel 600-718, Hastaloy C, Waspaloy, Stellite 6, Titanium.
AUSTENITIC STAINLESS STEEL	201, 203, 303, 304L, 316, 316L, 321, 327, NITRONIC 40, CUSTOM 455	<b>VC911</b> <b>VC901</b>	(TiAlN) INTERRUPTED CUTS/ROUGHING Stainless Steels, High Temp Alloys, Titanium Alloys. (PVD) SEVERE CONDITIONS AT SLOW SPEEDS 200-300 Stainless, Titanium, Inconel 718, Hastaloy C, Waspaloy.
PH & DUPLEX STAINLESS STEEL	15-5 PH, 17-4 PH, PH 13-8 M O, AM350, AM355, FERRALIUM 255, 329, S32950	<b>VC919</b> <b>SV310</b> <b>SV315</b>	(TiAlN) LIGHT ROUGHING Stainless Steels, High Temp Alloys. (TiC/AIO <sub>2</sub> /TiN) LIGHT ROUGHING TO HIGH SPEED FINISHING Stainless Steels, Steels. (TiC/AIO <sub>2</sub> /TiN) LIGHT ROUGHING TO HIGH SPEED FINISHING Steel, Stainless Steels, High Temp Alloys.
HIGH TEMPERATURE ALLOYS	Nickel Base: INCONEL 600, 625, 718 and X750; WAS PALOY; NIMONIC 90; UDIMET 500 and 700; MONEL ALLOYS IRON BASE: A-286; INCOLOY 800, 801, 802; N-155, 19-9DL COBALT BASE: L-605, HAYNES ALLOY 25, 188, HAYNES STELLITE 6, 21, WI-52	<b>SV325</b> <b>V1N</b> <b>VP8535</b>	(TiC/AIO <sub>2</sub> /TiN) GENERAL-PURPOSE ROUGHING & FINISHING Stainless Steels. (TiN) SEVERE ROUGHING & INTERRUPTED CUTS High Temp Alloys, Stainless Steels, Steel. (TiCN/Al <sub>2</sub> O <sub>3</sub> /TiN) ENHANCED WEAR RESISTANCE Stainless Steels: Ferritic, Martensitic, Austenitic, pH & Duplex. General-purpose grade.
TITANIUM ALLOYS	6Al-4V, 5Al-2.5 Sn, 6Al-2Sn-4Zr-6Mo	<b>VP5020</b> <b>VP5040</b> <b>VP5135</b> <b>VP5142</b> <b>VP7615</b>	(PVD TiAlN) FINISHING & SEMI FINISHING Steels, Stainless Steels, Cast Iron & Aluminum Alloys. (PVD TiAlN) GENERAL MACHINING & ROUGHING Steels & High Temp Alloys. (TiN/TiCN CVD) ROUGH MILLING Steels & Stainless Steel. (MTCVD) ROUGHING TO FINISHING APPLICATIONS on Carbon and Alloy Steels & Stainless Steel. (PVD TiAlN/TiN) LIGHT MACHINING Steels, Stainless Steel & High Temp Alloys.
		<b>IC50M</b> <b>IC250</b> <b>IC9025</b> <b>IC328</b>	<b>ISCAR</b> (C6) ROUGHING, HIGH FEEDS & INTERRUPTED CUTS Stainless Steels. (PVD) ROUGHING, INTERRUPTED CUT, MEDIUM SPEED/HIGH FEED Stainless Steel. (CVD) ROUGHING TO SEMIFINISHING Stainless Steel, Low Carbon, Low Alloy Steels. (PVD) ROUGHING LOW SPEED/HIGH FEED INTERRUPTED CUT Austenitic Stainless Steels, Exotic Alloys.
		<b>IC3028</b> <b>IC635</b> <b>IC907</b>	(PVD) HEAVY TURNING/CUTS Stainless Steel, High Temp Alloys. (CVD) SEMIROUGHING, MEDIUM SPEEDS & FEEDS Austenitic & Martensitic Stainless Steels. (TiAlN PVD) MACHINING IN LOW TO MEDIUM CUTTING SPEEDS. Austenitic & Martensitic Stainless Steels.
		<b>IC908</b>	(TiAlN PVD) GOOD FRACTURE TOUGHNESS & WEAR RESISTANCE. Austenitic & Martensitic Stainless Steels.
		<b>N60</b> <b>NN60</b> <b>NK533</b> <b>NK620</b> <b>NK710</b> <b>NP1000</b> <b>LT 10</b> <b>LT 30</b>	<b>NEWCOMER</b> (C50) ROUGHING, HIGH FEEDS & INTERRUPTED CUTS Steel, Steel Alloys, Stainless. (TiN) GENERAL-PURPOSE TO LIGHT ROUGHING AND FINISHING Steel, Steel Alloys, Stainless. (AO/TiN) ROUGHING AND FINISHING AT HIGH SFM (350-800) 300-400 Stainless. (AO/TiN) ROUGHING AND FINISHING AT HIGH SFM (450-1000) 300-400 Stainless. (AO/TiN) FINISHING AT HIGH SFM (550-1200) 300-400 Stainless. (CVD) ROUGHING, HIGH FEEDS & INTERRUPTED CUTS Steels, Stainless. (PVD) Turning. (PVD) Milling.
		<b>CM40</b>	<b>ALLIED</b> (PVD/TiAlN) COATED FINISHING to Medium Machining Steels, Stainless Steels & High Temp Alloys.

CATEGORY	ACTUAL MATERIALS	RECOMMENDED GRADE	
GRAY CAST IRONS	ASTM A48, CLASS 20, 25, 30, 35, 40 SAE J431C, GRADES G2000, G2500, G3000, G3500, G4000	<b>VC901</b> <b>VC929</b> <b>VC911</b> <b>VC919</b>	<b>VALENITE</b> (PVD) GENERAL-PURPOSE Aluminum, Copper Alloys. (PVD) LIGHT ROUGHING/FINISHING Aluminum, Copper Alloys. (TiAlN) INTERRUPTED CUTS Aluminum, and Copper Alloys. (TiAlN) LIGHT ROUGHING Cast Irons, Aluminum and Copper Alloys.
DUCTILE & MALLEABLE CAST IRONS - LOW & MEDIUM TENSILE	ASTM A536 GRADES 60-40-18, 65-45-12, 80-55-06, SAE J434C GRADES D4512, D5506, ASTM A220 GRADES 40010, 45006, 45008, 50005, 60004 SAE J158 GRADES M3210, M4504, M5003, M5503	<b>VC2</b> <b>VC29</b>	(Uncoated) GENERAL-PURPOSE APPLICATIONS Aluminum, Cast Irons, Copper, Brass, Plastics, Nonferrous Materials. (Uncoated) LIGHT FINISHING APPLICATIONS Aluminum, Cast Irons, Copper, Brass, Plastics, Nonferrous Materials.
DUCTILE & MALLEABLE CAST IRONS - LOW & MEDIUM TENSILE	ASTM A536 GRADES 100-70-03, SAE J434C GRADES D7003, ASTM A220 GRADES 70003, 80002, 90001, SAE J158 GRADES M7002, M8501	<b>SV315</b> <b>SV325</b>	(TiC/AIO <sub>2</sub> /TiN) LIGHT ROUGHING TO HIGH SPEED FINISHING Cast Irons, Ductile and Malleable Cast Iron. (TiC/AIO <sub>2</sub> /TiN) GENERAL-PURPOSE ROUGHING & FINISHING Cast Irons, Ductile and Malleable Cast Irons.
ALUMINUM & FREE MACHINING NONFERROUS MATERIALS	ALUMINUM ALLOYS 6061, 7075, 313, 356, 380, PRECIOUS METALS, PLASTICS	<b>VP5020</b> <b>IC20</b> <b>IC328</b>	(PVD TiAlN) FINISHING & SEMI FINISHING Steels, Stainless Steels, Cast Iron & Aluminum Alloys. <b>ISCAR</b> (UNCOATED) FINISHING & MEDIUM MACHINING Cast Irons, Silicon Aluminum, Copper Alloys. (PVD) ROUGHING AT LOW SPEEDS Aluminum Alloys, Copper Alloys, Exotic Alloys.
		<b>N21</b> <b>NP94</b> <b>LT 10</b> <b>LT 30</b>	<b>NEWCOMER</b> (UNCOATED) GENERAL ROUGHING TO LIGHT FINISHING Cast Irons, Aluminum Alloys, Nonferrous Materials. (AO/TiN) ROUGHING & FINISHING AT HIGH SPEEDS Cast Irons, Aluminum Alloys, Nonferrous Materials. (PVD) Turning. (PVD) Milling.
		<b>H216T</b>	<b>ALLIED</b> (Uncoated) GENERAL-PURPOSE APPLICATIONS Aluminum, Cast Irons, Copper, Brass, Plastics, Nonferrous Materials.

## CARBIDE GRADE COMPARISON CHART

INDUSTRY CLASS	VALENITE	NEWCOMER	ISCAR	KENNAMETAL	SANDVIK	SECO/CARBOLOGY
C2	VC2/VC28/VC29	N21/N22	IC20	K68	H13A	883
C6	VC5/VC7	N60	IC50/IC54	K21/K420	S4/S6	370
TiN (CVD)	V1N/VN5/VN8	NN60/NP1000	IC635/IC9025	KC9040/9045	GC4025/GC4035	TP30/TP200/TP300
TiN (PVD)	VC901/VC929	PV52	IC328/IC3028	KC730		
TiN/AIO <sub>2</sub> /TiN	SV315/SV325/SV410/SV415	NK533/NK620/NK710	IC908	KC850	GC3015	CP20