

CARBIDE GRADE SELECTION AND PREFORM BLANK DESIGN GUIDE

Successful Results Start From the Grade



hbcarbide.com

OUR PASSION IS PROVIDING OPTIMIZED SOLUTIONS FOR YOUR MOST CHALLENGING APPLICATIONS.

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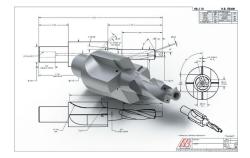
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GRADE SELECTION INTRO Successful Results Start From the Grade

AMERICAN MADE. AMERICAN PRIDE.

H.B. Carbide Company delivers custom and altered standard carbide blanks that provide consistency, reliability and advanced capabilities for your most demanding applications

- Manufactured in the USA from raw material to finished ground blank
- Providing consistent quality and reliable service for nearly 40 years
- Comprehensive grade/capability offering specialized to provide solutions to all your business and application challenges



SHAPING TANGIBLE SOLUTIONS

H.B. Carbide delivers tangible solutions through operational and manufacturing process efficiencies, reduced lead times, and overall productivity improvements.

- Straight flutes
- Spiral flutes
- Coolant holes (in any locations)
- Stepped diameters
- Centers (male or female)
- Keyways

- Flats
- Chamfers
- PCD pockets
- Preformed sharpening angles

||||##**#**#

Threads

CUSTOM, STANDARD AND ALTERED DESIGN

H.B. Carbide's experienced specialists are prepared and committed to support and assist you in your decision-making process to achieve optimized solutions, from grade selection to preform blank design.

- Advanced near net shape preform solutions
- Solid and coolant-through capabilities
- Pre-fluted blanks
- Large diameter and extended overall length
- Die and bushing blanks
- Centerless and between centers OD grinding
- Flow control products
- Program file sharing

VALUE ADDED FINISH GRINDING CAPABILITIES

- h5 and h6 diameter tolerances
- Multi-diameter grinding
- Lapped centers
- Centerless and between center OD grinding



Carbide Die & Bushing Blanks	Wire drawing dies, cold heading dies, stamping dies, wear parts, seal rings and bushings
Round Rod	Altered standard and standard offering
Drill & Reamer Blanks	Comprehensive offering of custom configurations
Deep Hole and Drill Blanks	Full-length or cut-to-length gundrill blanks with preformed pre-sharpened angles; Diverse coolant hole configurations offered; round, single hole, two hole and kidney holes

GRADE SELECTION INTRO Successful Results Start From the Grade

- Grade selection is crucial to meeting today's strict quality requirements and technical challenges, while maximizing productivity
- H.B. Carbide has a comprehensive grade offering specialized to provide solutions for all your business and application challenges
- We provide the optimum combination of high quality, consistency and performance reliability with industry-leading product/feature capabilities
- Committed service and focused support

NOT ALL MATERIALS ARE PRODUCED THE SAME

- H.B. Carbide is a fully-integrated manufacturer, from raw materials to finished ground blanks
- We partner with high-quality suppliers, ensuring quality/ consistency from the start
- Integrated quality systems ensure product performance and traceability
- Process control from raw materials to shipping ensure product quality, consistency and performance.



THE GRADE SELECTION PROCESS

Cutting/Wear and Impact/Toughness represent opposite ends of the carbide spectrum and are important in tool design. This chart provides a perspective for guiding the grade selection process in meeting those tool design challenges for a manufacturing applications.

HB-3	Cutting & Wear Resistance	Impact & Toughness	HB-411	Cutting & Wear Resistance	Impact & Toughness
HB-406	Cutting & Wear Resistance	Impact & Toughness	HB-312	Cutting & Wear Resistance	Impact & Toughness
HB-2	Cutting & Wear Resistance	Impact & Toughness	HB-115	Cutting & Wear Resistance	Impact & Toughness
HB-110	Cutting & Wear Resistance	Impact & Toughness	HB-315	Cutting & Wear Resistance	Impact & Toughness
HB-410	Cutting & Wear Resistance	Impact & Toughness	HB-320	Cutting & Wear Resistance	Impact & Toughness
HB-512	Cutting & Wear Resistance	Impact & Toughness	HB-325	Cutting & Wear Resistance	Impact & Toughness
HB-212	Cutting & Wear Resistance	Impact & Toughness			

GRADE SELECTION All Grades

Ultrafine Submicron Medium Coarse

e Bimodal

WEAR & DIE

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DEFENSE



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	Со	10%	Heat-resistant steels
HB-110	WC	90%	Corrosion-resistant steels
	Density	14.5 g/cm ³	Stainless steels
	Hardness	91.7 HRA	Non-ferrous metal alloys
	Grain Structure	Submicron	Titanium
A Start St	TRS	550,000psi	
Cutting & Wear Resistance	Impact & Toug	hness	
A			
	Со	6%	Diamond coating
HB-2	WC	94%	 Machining of graphite
的学校的意思的思想。	Density	14.9 g/cm ³	 Cast iron
	Hardness	92.2 HRA	 Non-ferrous metal alloys
	Grain Structure	Medium	 Nozzles and wear applications
	TRS	530,000psi	
Cutting & Wear Resistance	Impact & Toug	hness	-
	Co	6%	Stainless steels
HB-3	WC	94%	Plastics
	Density	14.9 g/cm ³	Diamond coating
	Hardness	93 HRA	Non-ferrous metal alloys

Submicron

520,000psi

12%

88%

- Wear applications, flow control
- Ctoiplass
- Stainless steels
 Titanium allous
- Titanium alloys
- Heat-resistant steels
- Interrupted cutting
- Diverse wear applications
- Shock-resistance applications
- Impact punches
- Punches and ejector pins
- Roughing, shearing applications

Cutting & Wear Resistance

Cutting & Wear Resistance

HB-5

Density	14.11 g/cm ³				
Hardness	92.5 HRA				
Grain Structure	Ultrafine				
TRS	640,000psi				
Impact & Toughness					

Grain Structure

Impact & Toughness

TRS

Со

wc

T	HB-115
\odot	
à	
	Cutting & Wear Resistance

Impact & Toughness				
TRS	610,000 psi			
Grain Structure	Submicron			
Hardness	90 HRA			
Density	14.0 g/cm ³			
WC	85%			
Co	15%			

Itting & Wear Resistance

6 H.B. CARBIDE COMPANY	nbcarbide.com
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					en kervali		
	GRADE SELEC All Grades	TION			METAL CUTTING	WEAR & D	DIE
			Ultrafine	Submicron	Medium	Coarse	Bimodal
(Lod)	HB-411 Cutting & Wear Resistance	Co WC Density Hardness Grain Structure TRS Impact & Tough	88.5% 14.39 g/cm ³ 90 HRA Bimodal 530,000psi	Heat-resista Stainless ste	els	punch applica	ations
	Lutting & wear Resistance	Impact & Tough	ness				
	HB-320	Co WC Density Hardness Grain Structure TRS	20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi	Header dies,	0		ails
	Cutting & Wear Resistance	Impact & Tough	· · ·				
(F)	HB-325	Co WC Density Hardness Grain Structure TRS			5		ails
	Cutting & Wear Resistance	Impact & Tough	ness				
	HB-312 Luting & Wear Resistance	Co WC Density Hardness Grain Structure TRS Impact & Tough	88% 14.33 g/cm ³ 88.7 HRA Coarse 490,000 psi				
	HB-315	Co WC Density Hardness	85% 14.03 g/cm3	applications Light stampi 	on-ferrous vari ng carbide die a g stamping dies	and nib deep d	Iraw

- Light stamping carbide die and nib deep draw
- Fine blanking stamping dies
- Ammunition dies

Cutting & Wear Resistance

Impact & Toughness

Grain Structure

TRS

470,000 psi

Coarse

GRADE SELECTION All Grades

Ultrafine Submicron Medium

Bimodal

WEAR & DIE

<u>F</u>

DEFENSE

Coarse



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	Cutting & Wear Resistance	Impact & Tougi	nness	
		TRS	334,000psi	
		Grain Structure	Bimodal	
		Hardness	92.3 HRA	Gundrill
)		Density	14.9 g/cm ³	wear properties
\mathbf{r}	HB-406	WC	94%	Bimodal grain structure offering excellent
		Со	6%	Ideal for deep hole drilling

HB-212 Co WC Density Hardness Grain Struc TRS

Со	12%
WC	88%
Density	14.28 g/cm ³
Hardness	90.2 HRA
Grain Structure	Medium
TRS	377,000psi

Impact & Toughness

Cutting & Wear Resistance

Со	10%
WC	90.0%
Density	14.5 g/cm ³
Hardness	91 HRA
Grain Structure	Bimodal
TRS	553,000 psi

	Excellent thermal cycling properties
_	

- Optimal braze adhesion
- Non-cutting grade
- Good toughness characteristics
- Ideal for deep hole drilling
- Exceptional toughness/wear properties
- Gundrill

Cutting & Wear Resistance

- Here	IKS	553
	Impact & Tough	ness





GRADE SELECTION Metal Cutting

H.B. Carbide prides itself in solving unique challenges for tool manufacturers by delivering a combination of superior service, industry-leading capabilities and material reliability.

Consistency is essential when working with critical metal cutting applications including aerospace (engine & frame) and medical, as well as high performance segments such as die and mold, oil and gas, wind power and automotive.

As a fully-integrated manufacturer, H.B. Carbide provides optimized cemented carbide grade selection, achieving the perfect balance of hardness and toughness for fracture resistance. Our company also provides improved edge wear reliability in cutting applications and superior adhesion in diamond coating applications and grades – for shank or carrier – on non-cutting application areas.

As your partner, we can quickly and reliably provide you with custom, altered and standard designs in solid and various coolant-hole configurations. Our extensive process knowledge and technical support help customers increase their cost effectiveness. This includes maximizing operational efficiency and productivity improvement, especially in work piece materials like aluminum, composites, heat resistant super alloys, stainless or high alloy steels and titanium.

WE PROVIDE A VARIETY OF CARBIDE DRILL AND REAMER BLANKS INCLUDING, BUT NOT LIMITED TO:

- Straight flutes
- Spiral flutes
- Coolant holes (in any location)
- Stepped diameters
- Centers (male or female)
- Flats
- Chamfers
- Keyways
- PCD pockets
- Carbide threads
- Deep hole drilling



Co	10%
WC	90%
Density	14.5 g/cm ³
Hardness	91.7 HRA
Grain Structure	Submicron
TRS	550,000psi

Cutting & Wear Resistance

Impact & Toughness

- Heat-resistant steels
- Corrosion-resistant steels
- Stainless steels
- Non-ferrous metal alloys
- Titanium



Со	6%
WC	94%
Density	14.9 g/cm ³
Hardness	92.2 HRA
Grain Structure	Medium
TRS	530,000psi

Impact & Toughness

Cutting & Wear Resistance

- . ..
- Diamond coatingMachining of graphite
- Cast iron
- Non-ferrous metal alloys
- Nozzles and wear applications



GRADE SELECTION Metal Cutting

Submicron Ultrafine

Coarse

Bimodal

Medium

	Со	6%		Со	12%
B-3	WC	94%	HB-512	WC	88%
	Density	14.9 g/cm ³		Density	14.11 g/cm ³
	Hardness	93 HRA		Hardness	92.5 HRA
	Grain Structure	Submicron		Grain Structure	Ultrafine
	TRS	520,000psi		TRS	640,000psi
Cutting & Wear Resistance	Impact &	Toughness	Cutting & Wear Resistance	Impact 8	Toughness
Stainless steels			Stainless steels		
Plastics			Titanium alloys		
			Heat-resistant steels		
	5		 Interrupted cutting 		

Cutting & Wear Resistance	Impact & Toughness		Cutting & Wear Resistance	Impact &	Toughness
	TRS	610,000 psi	特別が設定する	TRS	377,000psi
	Grain Structure	Submicron	高学生。2013年3月4日中国 第二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十二十	Grain Structure	Medium
	Hardness	90 HRA		Hardness	90.2 HRA
	Density	14.0 g/cm ³		Density	14.28 g/cm ³
HB-115	WC	85%	HB-212	WC	88%
	Со	15%		Со	12%

- Diverse wear applications
- Shock-resistance applications
- Impact punches
- Punches and ejector pins
- Roughing, shearing applications

Excellent thermal cycling properties

- Optimal braze adhesion
- Non-cutting grade
- Good toughness characteristics

HB-406

Co	6%
WC	94%
Density	14.9 g/cm ³
Hardness	92.3 HRA
Grain Structure	Bimodal
TRS	334,000psi

Cutting & Wear Resistance

Impact & Toughness

- Ideal for deep hole drilling
- Bimodal grain structure offering excellent wear properties
- Gundrill

	Со	10%
B-410	WC	90.0%
	Density	14.5 g/cm ³
	Hardness	91 HRA
	Grain Structure	Bimodal
	TRS	553,000 psi
Cutting & Wear Resistance	Impact &	Toughness

- Ideal for deep hole drilling
- Exceptional toughness/wear properties
- Gundrill

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GRADE SELECTION Defense

H.B. Carbide provides superior service, industry-leading capabilities and performance reliability, which are crucial factors in successfully supporting the defense industry's vast work piece material and application requirements. Whether it's military aircraft, ground defense, space exploration, shipbuilding, gun manufacturing or various defense systems designed to operate on land, sea or in the air, we are prepared to support you. Our fully-integrated capabilities, extensive process knowledge and experienced specialists are committed to helping you in your decisionmaking to achieve optimized solutions – from grade to customized blank specification.

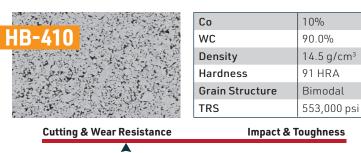
CAPABILITIES EXAMPLES INCLUDE, BUT ARE NOT LIMITED TO:

- Gundrills
- Ammunition die blanks
- Casing & bullet die blanks
- Deep hole drills
- Draw dies
- Punches
- Cartridge drawing die
- Preform round tool blanks
- Extensive wear part blank configurations



Co	6%				
VC	94%				
Density	14.9 g/cm ³				
lardness	92.3 HRA				
Grain Structure	Bimodal				
RS	334,000psi				
Impact & Toughness					

- Ideal for deep hole drilling
- Bimodal grain structure offering excellent wear properties
- Gundrill



- Ideal for deep hole drilling
- Exceptional toughness/wear properties
- Gundrill



GRADE SELECTION Defense

Ultrafine Submicron

Coarse

Bimodal

Medium

	Со	10%			Со	6%
-110	WC	90%	HB-3		WC	94%
	Density	14.5 g/cm ³			Density	14.9 g/cm ³
N. S.	Hardness	91.7 HRA	in the second second		Hardness	93 HRA
	Grain Structure	Submicron			Grain Structure	Submicron
	TRS	550,000psi	120 6 1	A THE K ST.	TRS	520,000psi
Cutting & Wear Resistance	Impact 8	Toughness	Cutting	& Wear Resistance	Impact &	& Toughness
Chamber reamers				ber reamers		
Heat-resistant steels				applications		
Non-ferrous metal alloys				applications and coating		
Titanium)			errous metal alloys	5	
	Со	12%			Co	15%
-312	wc	88%	HB-315		WC	85%
	Density	14.33 g/cm ³		all and a state	Density	14.03 g/cm
	Hardness	88.7 HRA	President.		Hardness	87.4 HRA
	Grain Structure	Coarse			Grain Structure	Coarse
	TRS	490,000 psi		REAL PROPERTY	TRS	470,000 ps
Cutting & Wear Resistance	Impact 8	& Toughness	Cutting	& Wear Resistance	Impact &	& Toughness
Low impact/light shock r	esistance		 Steels 	, SS, non-ferrous v	arieties forming a	applications
	esistance		SteelsLightsFine b		arieties forming a ie and nib deep d	applications
Low impact/light shock r Capability for wide variet Ammunition dies	sistance y of forming appli		SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	arieties forming a ie and nib deep d	applications
Low impact/light shock re Capability for wide variet Ammunition dies	esistance	ications	SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	arieties forming a ie and nib deep d lies	applications
Low impact/light shock r Capability for wide variet Ammunition dies	esistance y of forming appli Co	ications	SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	arieties forming a ie and nib deep d lies	applications raw 15% 85%
Low impact/light shock re Capability for wide variet Ammunition dies	 esistance y of forming appli Co WC 	ications 20% 80%	SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	A varieties forming a ie and nib deep d lies Co WC	applications raw 15% 85%
Low impact/light shock re Capability for wide variet Ammunition dies	 esistance y of forming appli Co WC Density 	ications 20% 80% 13.56 g/cm ³	SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	A rarieties forming a ie and nib deep d lies Co WC Density	applications raw 15% 85% 14.0 g/cm ³ 90 HRA
Low impact/light shock re Capability for wide variet Ammunition dies	 esistance y of forming appli Co WC Density Hardness 	20% 80% 13.56 g/cm ³ 85.4 HRA	SteelsLightsFine b	s, SS, non-ferrous v stamping carbide d lanking stamping c	A rarieties forming a ie and nib deep d lies Co WC Density Hardness	applications raw 15% 85% 14.0 g/cm ³
Low impact/light shock r Capability for wide variet Ammunition dies	Co WC Density Hardness Grain Structure TRS	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse	 Steels Light s Fine b Ammu 	s, SS, non-ferrous v stamping carbide d lanking stamping c	 arieties forming a ie and nib deep d lies Co WC Density Hardness Grain Structure TRS 	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron
Low impact/light shock re Capability for wide variet Ammunition dies Light stamping -320 Cutting & Wear Resistance	 esistance y of forming appli Co WC Density Hardness Grain Structure TRS Impact & 	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi	 Steels Light s Fine b Ammu HB-115 Cutting	s, SS, non-ferrous v stamping carbide d lanking stamping o unition dies	A varieties forming a ie and nib deep d lies Co WC Density Hardness Grain Structure TRS	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron 610,000 ps
Low impact/light shock re Capability for wide variet Ammunition dies Light stamping -320 Cutting & Wear Resistance Med-/High-impact formi	 esistance y of forming appli Co WC Density Hardness Grain Structure TRS Impact & Impact solutions 	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi 2 Toughness	 Steels Light s Fine b Ammu HB-1115 Cutting Diverse	s, SS, non-ferrous v stamping carbide d lanking stamping c inition dies & Wear Resistance	A varieties forming a ie and nib deep d lies Co WC Density Hardness Grain Structure TRS Impact &	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron 610,000 ps
Low impact/light shock re Capability for wide variet Ammunition dies Light stamping -320 Cutting & Wear Resistance Med-/High-impact formi Header dies, draw dies, s	 esistance y of forming appli Co WC Density Hardness Grain Structure TRS Impact & Impact solutions 	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi 2 Toughness	 Steels Light s Fine b Ammu HB-1115 Cutting Divers Shock 	s, SS, non-ferrous v stamping carbide d lanking stamping c inition dies & Wear Resistance & se wear application -resistance application	A varieties forming a ie and nib deep d lies Co WC Density Hardness Grain Structure TRS Impact &	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron 610,000 ps
Low impact/light shock re Capability for wide variet Ammunition dies Light stamping -320 Cutting & Wear Resistance Med-/High-impact formi Header dies, draw dies, s Fastener forming dies	 esistance y of forming appli Co WC Density Hardness Grain Structure TRS Impact & Impact solutions 	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi 2 Toughness	 Steels Light s Fine b Ammu HB-1115 Cutting Divers Shock Impace 	s, SS, non-ferrous wastamping carbide de lanking stamping carbide de unition dies & Wear Resistance & wear application -resistance application t punches	A varieties forming a ie and nib deep d dies Co WC Density Hardness Grain Structure TRS Impact & a a a a a a a a a a a a a a a a a a	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron 610,000 ps
Low impact/light shock re Capability for wide variet Ammunition dies Light stamping -320 Cutting & Wear Resistance Med-/High-impact formi Header dies, draw dies, s	 esistance y of forming appli Co WC Density Hardness Grain Structure TRS Impact & Impact solutions 	ications 20% 80% 13.56 g/cm ³ 85.4 HRA Coarse 455,000 psi 2 Toughness	 Steels Light s Fine b Ammu HB-1115 Cutting Divers Shock Impac Punch 	s, SS, non-ferrous v stamping carbide d lanking stamping c inition dies & Wear Resistance & se wear application -resistance application	A varieties forming a ie and nib deep d lies Co WC Density Hardness Grain Structure TRS Impact & s ations	applications raw 15% 85% 14.0 g/cm ³ 90 HRA Submicron 610,000 ps



GRADE SELECTION Energy

The energy industry plays a crucial role in our global infrastructure, the maintenance of our society, and our everyday life. H.B. Carbide is committed to supporting this global industry by providing superior service and material quality and reliability for these demanding applications and conditions. Whether you're in fossil fuel extraction, electrical, nuclear generation or renewable energy including hydroelectric, wind or solar power generation, we have a solution for your carbide blank component requirements.

OUR APPLICATION SPECIFIC GRADE OFFERING AND INDUSTRY LEADING CAPABILITIES ALLOW RELIABILITY IN MANY PRODUCT COMPONENTS INCLUDING:

- Flow control
- Nozzles
- Trim
- Valve parts
- Bushings
- Bearings
- Rods
- Rings
- Tubes square
- Flat bars





GRADE SELECTION Energy

Ultrafine Submicron Coarse

Bimodal

Medium

5.50	in the state	
HB-11	0	
		and the second sec
S. S. P.	A A	the states

Co	10%
WC	90%
Density	14.5 g/cm ³
Hardness	91.7 HRA
Grain Structure	Submicron
TRS	550,000psi

Impact & Toughness

Cutting & Wear Resistance

- Heat-resistant steels
- Corrosion-resistant steels
- Stainless steels
- Non-ferrous metal alloys
- Titanium

	Со
HB-2	W
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	Ha
	Gr
	TR

Со	6%
WC	94%
Density	14.9 g/cm ³
Hardness	92.2 HRA
Grain Structure	Medium
TRS	530,000psi

Cutting & Wear Resistance

Impact & Toughness

- Diamond coating
- Machining of graphite

Fastener forming dies

Ammunition dies

Cast iron

- Non-ferrous metal alloys
- Nozzles and wear applications

Header dies, draw dies, stamping die details

	Со	6%		Со	20%
HB-3	WC	94%	HB-320	WC	80%
23-15 	Density	14.9 g/cm ³	S. ME GAR ST STATE	Density	13.56 g/cm ³
	Hardness	93 HRA		Hardness	85.4 HRA
	Grain Structure	Submicron		Grain Structure	Coarse
A A A A A A A A A A A A A A A A A A A	TRS	520,000psi		TRS	455,000 psi
Cutting & Wear Resistance	Impact 8	k Toughness	Cutting & Wear Resistance	Impact &	Toughness
Stainless steels			Med-/High-impact formi	ng applications	

- Stainless steels
- Plastics
- Diamond coating
- Non-ferrous metal alloys
- Wear applications, flow control



GRADE SELECTION Wear & Die

The need for maximum resistance to impact, wear, deformation and fracture is crucial to achieve success in many industries and production processes. H.B. Carbide is committed to improving productivity by providing effective carbide blank solutions that address component deterioration and failure issues in wear and die application areas. As a fully-integrated manufacturer, we have the ability to manage the complete part cycle from powder to ground blank. This allows us to ensure optimum grade selection, part-to-part reliability, and the flexibility needed to achieve unique geometric designs. We accomplish all this while delivering exceptional technical support for an overall superior customer experience.

CAPABILITIES EXAMPLES INCLUDE, BUT ARE NOT LIMITED TO:

- Forming dies
- Compacting dies
- Stamping dies
- Punches and ejector pins
- Nozzles
- Drawing dies
- Rolls
- Slitter knives
- EDM blanks





Co	11.5%	
WC	88.5%	
Density	14.39 g/cm ³	
Hardness	90 HRA	
Grain Structure	Bimodal	
TRS	530,000psi	
Impact & Toughness		

Cutting & Wear Resistance

- Exceptional performance in punch applications
- Heat-resistant steels
- Stainless steels
- Non-ferrous metal alloys



Co	12%
VC	88%
Density	14.33 g/cm ³
lardness	88.7 HRA
Grain Structure	Coarse
RS	490,000 psi

Cutting & Wear Resistance

Impact & Toughness

- Low impact/light shock resistance
- Capability for wide variety of forming applications

- Ammunition dies
- Light stamping



GRADE SELECTION Wear & Die

Ultrafine Submicron Medium

Coarse

Bimodal

	Со
HB-315	W
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	Ha
	Gr
等的人的关系。	TR
Cutting & Wear Resistance	

Со	15%
WC	85%
Density	14.03 g/cm3
Hardness	87.4 HRA
Grain Structure	Coarse
TRS	470,000 psi

Cutting & Wear Resistance

Impact & Toughness

- Steels, SS, non-ferrous varieties forming applications
- Light stamping carbide die and nib deep draw
- Fine blanking stamping dies
- Ammunition dies



Со	25%
WC	75%
Density	13.18 g/cm ³
Hardness	83.3 HRA
Grain Structure	Coarse
TRS	430,000 psi

Cutting & Wear Resistance

Impact & Toughness

- High Impact forming applications
- Header dies, draw dies, stamping die details
- Thread rolling
- Ammunition dies



0	15%
/C	85%
ensity	14.0 g/cm ³
ardness	90 HRA
rain Structure	Submicron
RS	610,000 psi

Impact & Toughness

Cutting & Wear Resistance

- Diverse wear applications
- Shock-resistance applications
- Impact punches
- Punches and ejector pins
- Roughing, shearing applications



Со	20%
WC	80%
Density	13.56 g/cm ³
Hardness	85.4 HRA
Grain Structure	Coarse
TRS	455,000 psi

Cutting & Wear Resistance

Impact & Toughness

- Med-/High-impact forming applications
- Header dies, draw dies, stamping die details
- Fastener forming dies
- Ammunition dies

	WC Density	90% 14.5 g/cm ³
	Hardness	91.7 HRA
	Grain Structure	Submicron
	TRS	550,000psi
Cutting & Wear Resistance	-	550,000psi

- Calibration Dies
- Cold Forming Punches (high wear resistance)
- Drawing Dies
- Mandrels (ferrous & non-ferrous)

NOTES

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DISCOVER WHAT THE **H.B. CARBIDE ADVANTAGE** CAN DO FOR YOU

- Responsible corporate citizen social, cultural and environmental responsibilities
- **Reliable partner** for global supply & support
- Sustainability Environmentally focused, including recycling of carbide scraps
- **Focus on customer experience –** Service Supply & Technical Support
- Material innovation Optimized application specific grade selection
- Advanced production controls and techniques ensuring quality and consistency



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