

GRADE COMPARISON CHART



Understanding Creative Carbide, Inc.'s Grades

What is Tungsten Carbide? Tungsten Carbide is the homogenous blend of tungsten grains (WC) in a Cobalt (Co) binder environment. The material is usually also called "cemented carbide", a metal matrix composite where tungsten carbide particles are the aggregate and metallic cobalt serves as the matrix. The process of combining tungsten carbide with cobalt is referred to as sintering or HIP (Hot Isostatic Pressing). During this process cobalt eventually will be entering the liquid stage and WC grains (>> higher melting point) remain in the solid stage. As a result of this process cobalt is embedding/cementing the WC grains and thereby creates the metal matrix composite with its distinct material properties. While there are many different grades of Tungsten Carbide available that may contain other elements other than WC and Co for different applications, the most usual primary properties of any given grade (Hardness and Toughness) are determined by the ratio of Tungsten Carbide to Cobalt. Ideally, the lower percentage of Cobalt and/or smaller grain size will produce a harder but more brittle material. Conversely, higher percentage of cobalt and/or larger grain size will produce a tougher but softer material.

Below we depict our grades and their physical properties for your reference:

GRADE	TUNGSTEN	TANTALUM	COBALT	AVERAGE GRAIN SIZE	DENSITY 9/CM ³	HARDNESS HRA
CC6M	94%		6%	Medium	14.80 - 15.00	90.0 - 91.0
CC6S	94%		6%	Submicron	14.80 - 15.00	92.0 - 93.0
CC10M	90%		10%	Medium	14.30 - 14.50	89.0 - 90.0
CC12M	88%		12%	Medium	14.20 - 14.40	88.5 - 89.5
CC12C	88%		12%	Coarse	14.10 - 14.30	87.5 - 88.5
CC15M	85%		15%	Medium	13.90 - 14.10	87.5 - 88.5
CC17M	83%		17%	Medium	13.60 - 13.80	87.0 - 88.0
CC20M	80%		20%	Medium	13.50 - 13.70	85.0 - 86.0
CC20MT	77%	3%	20%	Medium	13.50 - 13.70	85.5 - 86.5
CC25C	75%		25%	Coarse	13.00 - 13.30	83.0 - 85.0
CC25CT	72%	3%	25%	Coarse	13.00 - 13.30	83.0 - 85.0
CC30M	70%		30%	Medium	12.80 - 13.00	81.5 - 83.0

GRADE	C	Creative
	C	Carbide
	25	Cobalt Percentage
	C	Grain Size
	T	Contains Tantalum

GRAIN SIZE	S	Sub Micron - Average Below 1 Micron
	F	Fine - Average 1 Micron
	M	Medium-Average 2-3 Micron
	C	Coarse - Average over 3 Micron. Up to 5 Micron



7880 Interstate Court
Unit A
N. Fort Myers, FL 33917

www.creativecarbideinc.com
sales@creativecarbideinc.com

Toll-free Phone: 800-969-9985 / Phone: 239-567-0041

Toll-free Fax: 800-969-9986 / Fax: 239-567-1358

GRADE COMPARISON CHART



ONLY COMPANY THAT SINTERS AND SEMI-FINISHES ALL THEIR CARBIDE AND OFFER IN HOUSE HOT ISOSTATIC PRESSING (HIP):

CREATIVE CARBIDE INC.	CC6M	CC6S	CC10M	N/A	CC12M	CC12C	CC15M	CC17M	CC20M	CC20MT	CC25C	CC25CT	CC30M
-----------------------	------	------	-------	-----	-------	-------	-------	-------	-------	--------	-------	--------	-------

COMPANIES THAT SINTER ONLY

<u>Industry Classification</u>	C-2	C-2	C-10	C-5	C-11	C-11	C-12	C-12	C-13	C-13	C-14	C-14	C-14
A-1 Carbide *	A1-6A	A1-C6	A1-C11	N/A	A1-C13	N/A	A1-C16	N/A	A1-CN20	N/A	A1-CN25	A1-C25	N/A
Basic Carb	BC6	BC6S	BC9	N/A	BC13	13C12C	BC15	N/A	BC20C	N/A	BC22	N/A	N/A
Carbidie Corporation *	CD30	CD630	CD36	N/A	CD38	CDMR11	CD50	CD55	CD60	N/A	CD70	N/A	N/A
Carmet *	D20	CA306	D30	CA740	CA311	D40	D50	N/A	D60	D60	D70	D76	N/A
General Carbide	206	106	310	313T	313	612	315	970	320	320T	325	325T	330
H.B. Carbide Company	HB-2	HB-3	HB-100	N/A	N/A	HB-411	HB-115	N/A	HB-320	N/A	HB-325	N/A	N/A
Hydro Carbide	HC292	HCU506	DC400	N/A	HC410	HC509	HC600	N/A	HCM20	N/A	HCM25	N/A	N/A
Innovative Carbide	IC6	IC6S	IC9	N/A	IC13	IC311	IC15	N/A	IC320	N/A	IC325	N/A	N/A
Michigan Carbide	N/A	N/A	MC9	N/A	MC13	N/A	MC15	N/A	MC20	N/A	MC25	MC223	N/A
Teledyne	H6	FK10F	H17	FP30B	CE302	P192	H71	R52	ND20	ND20	ND25	ND25	ND30
Valenite	VC2	VC29	VC10	VC5	VC11	N/A	VC12	N/A	VC13	N/A	VC14	N/A	N/A
Vista Metals	VM6	VM6M	VM9	N/A	VM12	VM12C	VM15	VM17	VM20	VM20H	VM25	VM25H	VM30

* Companies now owned by Kennametal

COMPANIES THAT SEMI-FINISH ONLY

Contemporary Carbide	CCT6M	CCT6S	CCT10M	CCT10MT	CCT12M	CCT12C	CCT15M	CCT17M	CCT20M	CCT20MT	CCT25C	CCT25CT	CCT30M
USA Carbide	U6	U6F	U9	U13T	U13	U12C	U15	U17	U20	U20T	U25	U25T	U30

COMPANY THAT SINTER SOME OF THEIR NEEDS AND SEMI-FINISH

Rockform Carbide Mfg.	R-6	R-6M	R-9	N/A	R-12	R-12C	R-15	RD-50	R-20	RD-60	R-25	RD-70	RD-80
------------------------------	-----	------	-----	-----	------	-------	------	-------	------	-------	------	-------	-------



Disclaimer: This document is to be considered as a reference only! All information was obtained from the 6th Edition of the "World Directory and Hand Book of Hard Metals and Materials" and / or individual company websites. Not responsible for erroneous data.



7880 Interstate Court
Unit A
N. Fort Myers, FL 33917

www.creativecarbideinc.com
sales@creativecarbideinc.com

Toll-free Phone: 800-969-9985 / Phone: 239-567-0041

Toll-free Fax: 800-969-9986 / Fax: 239-567-1358