

[PRODUCTS DATA]

CONDITIONS UNDER WHICH FRACTURE, BREAKAGE AND ABNORMAL WEAR ARE APT TO OCCUR

Conditions under which fracture, breakage and abnormal wear are apt to occur

Factor	Conditions	Probability of punch tip being fractured	Probability of heavy wear occurring	Probability of thin punch being broken
		High/Medium/Low	High/Medium/Low	High/Medium/Low
Material of tools	Too high heat treatment hardness.	○	○	○
	Nonuniform material (e.g. internal defect)	○	○	○
	Approximation between tool material and workpiece material.	○	○	○
Material of workpiece	Presence of oxide film on surface.	○	○	○
	High hardness.	○	○	○
	High elongation and viscosity.	○	○	○
Working conditions	Tool contour	Too long relative to diameter.	○	○
		Too small roundness in punch shoulder.	○	○
		Sharp corner contained in cutting edge.	○	○
	Clearance	Too small.	○	○
		Biased.	○	○
	Lubrication	No lubrication provided.	○	○
		Improper lubricant.	○	○
	Bridge width	Uneven.	○	○
Punch guide	No punch guide provided.	○	○	
	Poor punch guide accuracy.	○	○	
Retention of workpiece	No plate retainer provided.	○	○	
	(When fixed stripper is used). Insufficient plate retaining force.	○	○	
Anomaly during punching	Double shot or two-plate shot takes place.	○	○	
Press, die set	Poor press rigidity.	○	○	
	Poor press accuracy.	○	○	
	Poor die set accuracy.	○	○	

Press Working Data Book, 1980, the Nikkan Kogyo Shimbun Ltd.

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CEMENTED CARBIDE TOOL MATERIALS FOR WEAR RESISTANCE

Table of comparison of cemented carbide tools for wear resistance

Application	Classification of applicability code	Tungaloy	Sumitomo Electric Hardmetal	Mitsubishi Materials	Dijet Industrial	Hitachi Tool Engineering	Fuji Dice	Nippon Tungsten	Sanalloy Industry	Kyoritsu GOKIN	Silver Alloy
For general wear-resistant impact-resistant tools	V10	D50	D1	GTi05	D1	WH10 WH20	D10 D20	G1	DA10 DA20 DA25	H1 G1 KD05	G1 G2
	V20	D20 D25	D2	GTi10 GTi15	D2	WH30	D40 D50 C50 G55	G2	DA30 VA30	G2 KD10 A10W	G3
	V30	D30	D3 ED30	GTi20	D3 NC2 NC6 NC8	WH40	D60	G3 G20	DA50 VA40	G3 G4 KD20 MC30	G4
	V40 *	D40	G5 ED50	GTi30	G5 NC10 GD195	WH50	C60 G65	G30 G40	DA60 VA50 EA50	G5 TB6 KD40	G5 6F
	V50 *	D50	G6	GTi35 GTi30S GTi40	MH4 GD174 GD201	WH60	C70 C84 G70 G85	G50 G60	VA60 VA70 EA60 EA70	TB7	G6 F65 G65
	V60 *	D60 D70	G7 G8	GTi40S GTi50S	MH5 MH7 GD206	WB60	C95	G80 SD1	VA80 EA80 EA90	G8	G7 G8 7F 8F
Ultrafine grain cemented carbide	For cutting tools	Z01	F MD08F	F0	ZH104 SF10 MF10	FZ05 FB10	NM08	F08			
		Z10	M MD10 MD05F	XF1 F1 AFU	HTi10 MF20	FZ10 FZ15 FB15	NM15	F10 M10	FN10 FN20		EF05
		Z20	MD15 MD20 EM10	AF0 SF2 AF1	TF15 UF30	FZ20 FB20	BRM20 EF20N	F20	FN30 SF30	FD25	EF10
		Z30	UM	A1 CC		FZ25	NM25		FN40 SF50		EF20
	For wear and impact resistance	V10	F	F0 SF1 ED10 AFU	UF20	FB15 FZ10 FZ15		F08 F10 F20 M10	FN10 FN20		EF05 EF10
		V20	EM10	AF0 AF1	UF30	FB20 FZ20			FN30 SF30	FD25	EF20 SF20 SF05
		V30		A1 CC		FZ25	NM25		FN40	FD15	SF25 SF30
		V40 *					NM40		SF50		

* : Standard of Carbide Tool Association

Classification of applicability of cemented carbide

Unit : Wt%

Classification of applicability code	Hardness HRA	Traverse rupture force N/mm ² (kgf/mm ²)	Metal component		Hard phase component	
			Co	W-based hard phase	W-based hard phase	W-based hard phase
V10	Over 89	1170 or more (120 or more)	3~6	88~91		
V20	Over 88	1275 or more (130 or more)	5~9	88~90		
V30	Over 87	1471 or more (150 or more)	8~16	78~87		
V40	Over 85	1864 or more (190 or more)	11~20	73~85		
V50	Over 83	2060 or more (210 or more)	14~25	70~82		
V60	Over 78	2256 or more (230 or more)	17~30	65~78		

(Standard of Carbide Tool Association CIS 019C—1990)

Notes 1. The classification of applicability codes from V10 to V30 and the values for them are in accordance with JIS B 4053.

2. The classification of applicability codes should not be used as material type codes.

3. Some cemented carbide manufactures have a plurality of material type codes of their own corresponding to one and the same code of classification of applicability.

Ultrafine grain cemented carbide

Classification of applicability code	Hardness HRA	Traverse rupture force N/mm ² (kgf/mm ²)
Z01	Over 92	1177 or more (120 or more)
Z10	Over 91	1275 or more (130 or more)
Z20	Over 89.5	1471 or more (150 or more)
Z30	Over 88.5	1668 or more (170 or more)

(JIS B4053—1989)

Criteria for cemented carbide selection

Rough classification	Name		Classification of applicability code					
	Name and classification of item		High ← Wear resistance → Low					
			V10	V20	V30	V40	V50	V60
Trimming die	Die	Light load involved						
		Heavy load involved						
	Punch	Light load involved						
Heavy load involved								
Drawing die	Drawing die	Light load involved						
		Heavy load involved						
	Drawing punch	Light load involved						
		Heavy load involved						
Powder metal compacting die	Die	Round						
		Deformed						
	Punch							
Other wear-resistant, impact-resistant tools and components	Small impact involved	Gauge, valve, nozzle, seal ring, precision ball, etc.						
	Medium impact involved	Bending die, crusher, spike, etc.						
	Large impact involved	Engraver, coining die, coining punch, impact die, swaging die, nail making tool, hot extrusion die, polishing disk, etc.						

(Standard of Carbide Tool Association CIS 019C—1990)