

## Cutting edge series milling inserts for mould & die industry

### Safety precautions:

- Very hot or lengthy chips may be discharged while the machine is in operation. So, safety goggles or other protective covers must be used.
- In cutting process, sparks and hot chips may cause fire and explosion hazard. Therefore please make sure the fire extinguishers are ready for use.
- Improper cutting conditions or mis-handling of the tool may result in breakages or projectiles. Therefore, please use the tool within its recommended conditions.
- Please handle with care as this product has sharp edges.



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## INTRODUCTION

Zhuzhou Huarui Cemented Carbide Tools Co.,Ltd. is a high and new tech enterprise engaged in the production of cemented carbide cutting tools for CNC machinery, the municipal supporting institution of Zhuzhou Carbide Precision Cutting tool Engineering Technology Research Center. Also the production line has been named key project of “Manufacture makes Hunan stronger”. In the market, its “Hardstone” Brand products with excellent properties have been widely used in industries of automobiles, aviation & aerospace, rail traffic, heavy equipment, mold manufacture, power equipment,etc. and have been accepted by customers. Therefore they are selling to various overseas markets.

With its good development prospects, the company has won great favor from various investors. The well-known domestic equity investment funds invested a large sum of money for company in 2011, 2015 and 2017, which has speeded up the introduction of high-tech manufacturing equipments and quality test instruments. Therefore, the product quality has climbed one storey higher & reached the first- class in Asia.

The company has in its possession a strong technical strength & has forged a top domestic specialized & high-level R & D team of old, middle-aged & young professional personnel. They included experts enjoying special allowance of the state council & introduced outstanding CNC talents. The company has its own R&D Center consisting of material research, products design, mould design & manufacture, cutting experiments & technical application service, etc. ensuring the provision to customers of the best solutions to products & technical service. At present, the company has 22 nationally authorized patents.

The company has its quality control system covering the whole processes with independent intellectual property rights to guarantee the stability and consistency of its products. The company was awarded ISO9001:2000 quality management system certificate.2014, enterprise have passed 2008 quality standard system certificate.

The company has experienced sales engineers and technical application engineers, and has set up its product and technical service branched in China’s major industrial cities to provide the most professional and efficient service.

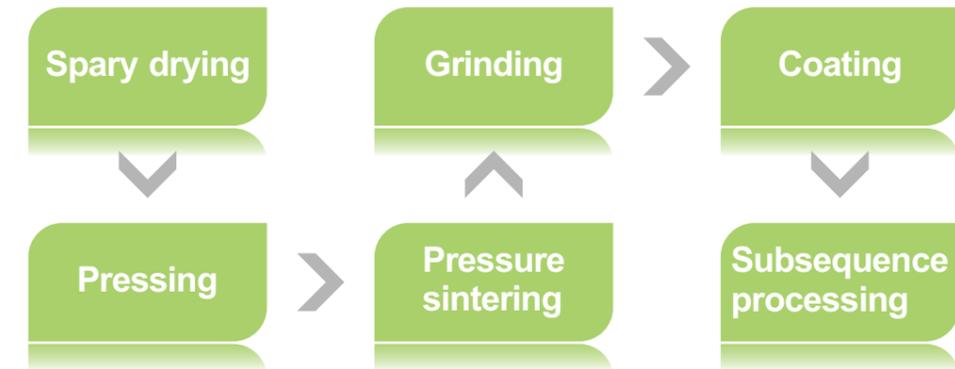


## EQUIPMENT

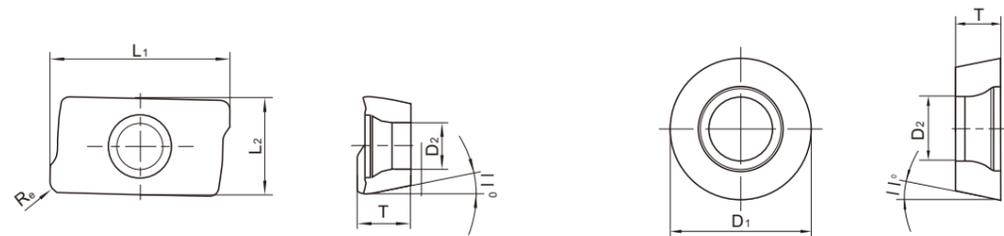
The company has a full set of high-level producing equipments ranging from raw power material preparation, mould manufacture, pressing, pressure sintering, grinding to post processing. We use spray drying tower in mixing process. Its advanced technique ascertains the best performance behavior of material in physical property and formability.

Using powder compacting press with Electro-Servo Motor Direct Drive, the most advanced machine for press shaping in the world, which meet the high requirements on precision, performance and stability. For sintering, we equipped the most advanced devices to meet the quality requirements on chemical and physical performance.

For grinding and machining, we equipped Fully auto CNC periphery insert grinder, CNC two-wheel flat lapping machine etc. to ensure product shape and precision demand. We also use the most advanced PVD/CVD coating machines. The state-of-the-art subsequence process devices equipped for better performance.

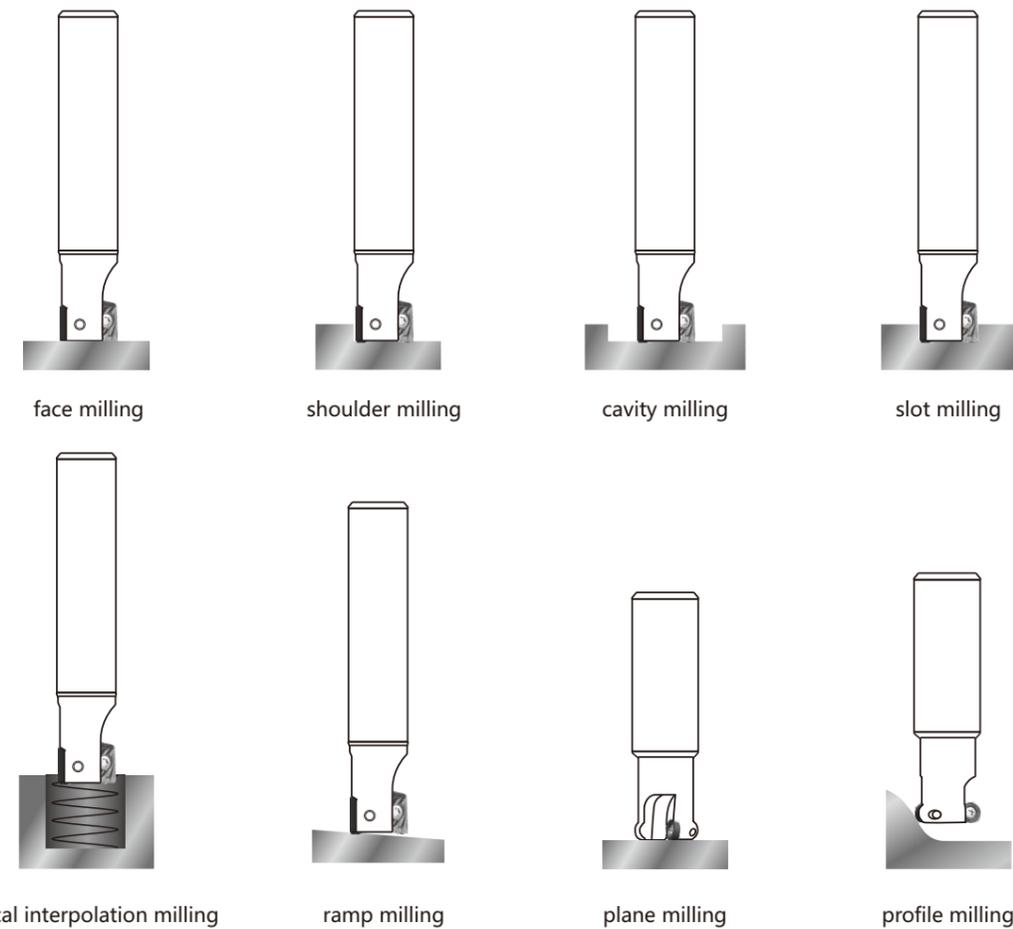


## Schematic diagram of milling inserts dimension



Inserts shape	Type	Dimension ( mm )						Cutting parameters
		L1	L2	Re	D2	T	D1	
	APMT1135PDER-FM	11.3	6.25	0.8	2.8	3.5	—	apmax:5.0mm, fz:0.10~0.50mm/z
	APMT1605PDER-FM	17.42	9.33	0.8	4.5	5.22	—	ap:5.0mm, fz:0.10~0.60mm/z
	RPMT1003MO-FM	—	—	—	4.5	3.18	10	apmax:5.0mm, fz:0.10~0.80mm/z
	RPMT1204MO-FM	—	—	—	4.5	4.76	12	apmax:6.0mm, fz:0.20~1.00mm/z

## Schematic diagram of cutting processes



## Milling inserts' Features

- ◆ Design with double clearance angle and special treatment on its cutting edge and tool nose. High dimensional accuracy, fine and smooth surface.
- ◆ Using fine cemented carbide substrate with unique process and excellent coating, which achieved the combination of hardness, toughness and higher red hardness.
- ◆ According to the different hardness of mould workpiece , evaluate the service life of cutting tools accurately. In this way, automatic and unmanned processing is realized and raises the production efficiency.
- ◆ Suitable for processing of face milling,shoulder milling,cavity milling,ramp machining ,profile milling, etc.
- ◆ Well solved the difficulty of tools selection and replacement, thus reducing tools inventory costs.
- ◆ Versatility,good stability, long service life, high cost-effective. machining ,profile milling, etc.



## Brief introduction of main workpiece materials

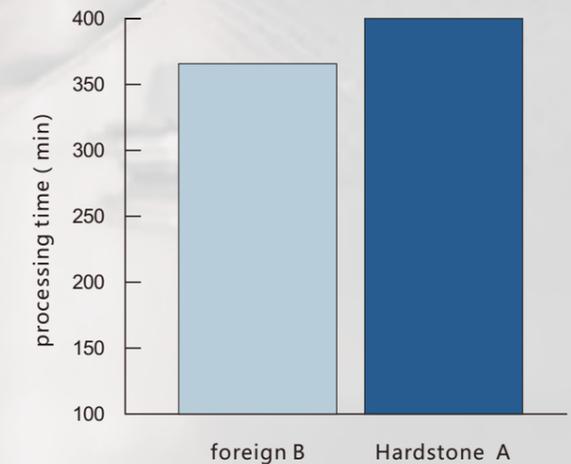
- ◆ C45W commonly known as 45 # steel, Hong Kong named it ace steel. Hardness is range from HB170 to HB220. Has widely application, and the price is relatively cheap.
- ◆ Germany's 40CrMnMo7 is used as pre-hardened plastic mould steel, hardness range from HRC28 to HRC40. Its advantage is higher hardness than medium carbon steel and more stable on deformation.
- ◆ US grade P20 belongs to plastic mould steel, Called 3Cr2Mo in China. This grade steel has uniform hardness range from HRC30 to HRC42, with good polishing and light etching performance, which suitable for large and medium-sized precision moulds matching with large die-set. This steel has good machine ability and widely used in plastic moulds.
- ◆ Pre-hardened plastic mould steel NAK80, delivery hardness from HRC37 to HRC43. Has a good polish and carve ability, good discharge performance, and commonly used in mirror polishing mould.
- ◆ 4Cr5MoSiV1, American-standard is H13. Before the heat treatment, hardness range from HRC15 to HRC 20, has excellent high-temperature strength, wear resistance, toughness and other comprehensive mechanical properties. Good harden ability, small thermal deformation, and easy for processing, which is suitable for larger size, complex shape mould. Widely used in aluminum, zinc die-casting mould applications.
- ◆ The varieties of 7185, 738H, 745H, Nak5, etc. have just accounted for about 15% to 20% in mould applications. The processing of these kinds is more difficult to machining than 45 # steel which mainly for the mould core and cavity.

## WS5130 Grade Features

- ◆ Strict control of substrate production, lead to the optimal and stable performance of all property indexes.
- ◆ Because of the special raw material matching and production technique, the substrate has a better impact resistance and wear resistance, which effectively prevent the break and abrasion
- ◆ The special treatment to the substrate surface, contribute to more stable combination of substrate and coating.
- ◆ The new generation of high-aluminum coating cutting tools can well machining high hard steel, stainless steel, cast iron, etc.. Stability machining and excellent performance, greatly extend the tools' service life.

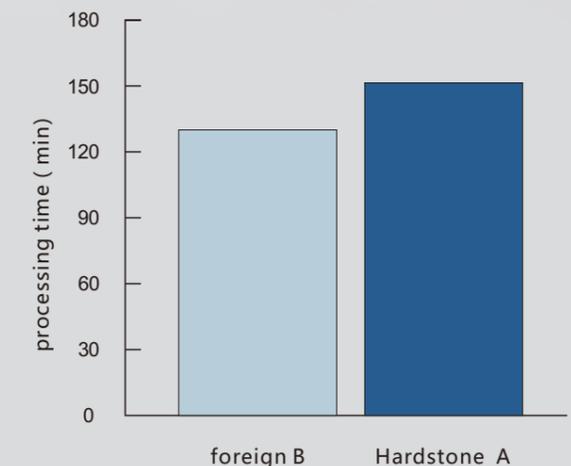
### Application Case Comparison No.1

Workpiece material : steel 45#  
 Material hardness : HB200 Holder :  $\phi 63 \times 6t$   
 Inserts type : APMT1605PDER-FM  
 Cutting parameters  
 $S=800\text{rpm}$   $f=4800\text{mmpm}$   $a_p=0.5\text{mm}$   $a_e=45\text{mm}$   
 Result of cutting  
 Hardstone A processing for 400mins , normal wear without breakage. Foreign B processing for 370mins , slight chipping.



### Application Case Comparison No.2

Workpiece material : P20  
 Material hardness : HRC30  
 Holder :  $\phi 20 \times 2t$   
 Inserts type : APMT1135PDER-FM  
 Cutting parameters  
 $S=2200\text{rpm}$   $f=2500\text{mmpm}$   $a_p=0.27\text{mm}$   
 Result of cutting  
 Hardstone A processing for 150mins, normal wear on flank and rake surface. Foreign B processing for 130mins, cutting edge slight chipping.



## Application Cases

### 45# steel cavity milling

Parts	steel 45#	
Machining way	D50-Z4-L125 overhang BT40 dry rough cavity milling	
Inserts type/Grade	RPMT1003MO-FM WS5130	
Cutting parameters	Vc=180m/min , fz=0.8mm/z , ap=0.4mm ae=32mm	
Result of cutting	Hardstone : 240min/cutting edge,normal wear, Foreign brand M : 210min/cutting edge,slight chipping.	

### NAK80 rough milling

Parts	High polished pre-hardened steel NAK80 (HRC38~42)	
Machining way	D16-Z2-L60 overhang BT40 dry rough face milling	
Inserts type/Grade	APMT1135PDER-FM WS5130	
Cutting parameters	Vc=125m/min , fz=0.4mm/z , ap=0.25mm ae=12mm	
Result of cutting	Hardstone : 46min/cutting edge,normal wear , Foreign brand D : 38min/cutting edge,normal wear.	

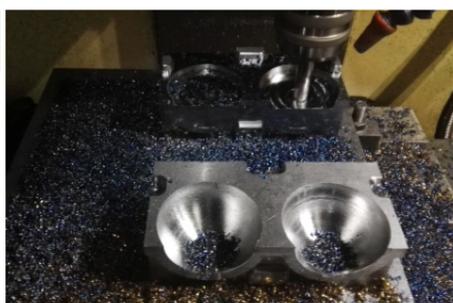
### P20 rough milling

Parts	P20 plastic mould	
Machining way	D63-Z4-L200 overhang BT50 dry rough milling mould	
Inserts type/Grade	RPMT1204MO-FM WS5130	
Cutting parameters	Vc=158m/min , fz=0.75mm/z , ap=0.8mm ae=40mm	
Result of cutting	Hardstone : 150min/cutting edge,normal wear , Foreign brand D : 130min/cutting edge,slight chipping.	

### H13 aluminium extrusion mould

Parts	aluminium extrusion mould H13	
Machining way	D16-Z2-L104 overhang BT40 dry rough milling hole	
Inserts type/Grade	APMT1135PDER-FM WS5130	
Cutting parameters	Vc=177m/min , fz=0.55mm/z , ap=0.28mm ae=16mm	
Result of cutting	Hardstone : 50min/cutting edge,normal wear, Foreign brand D : 48min/cutting edge,normal wear.	

### 718H rough milling

Parts	Plastic bulbs female mould pre-hardened steel 718H ( HRC38~42 )	
Machining way	D17-Z2-L65 overhang BT40 dry rough milling ball socket	
Inserts type/Grade	APMT1135PDER-FM WS5130	
Cutting parameters	Vc=160m/min , fz=0.8mm/z , ap=0.25mm ae=10mm	
Result of cutting	Hardstone : 91min/cutting edge,normal wear , Foreign brand D : 80min/cutting edge,normal wear.	



### S136 corrosion-resistant mould steel rough milling

Parts	S136 corrosion-resistant mould steel
Machining way	D17-Z2-L70 overhang BT40 dry rough face milling
Inserts type/Grade	APMT1135PDER-FM WS5130
Cutting parameters	Vc=160m/min , fz=0.6mm/z , ap=0.25mm ae=10mm
Result of cutting	Hardstone : 287min/cutting edge,normal wear.



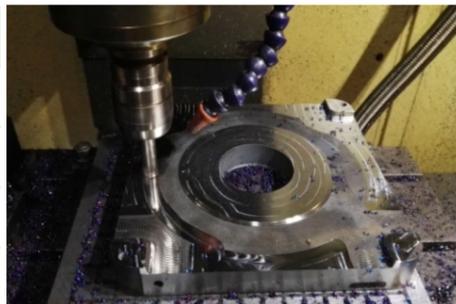
### S136 hardened steel rough milling

Parts	S136 hardened steel mould ( HRC48 )
Machining way	D17-Z2-L65 overhang BT40 dry rough milling
Inserts type/Grade	APMT1135PDER-FM WS5130
Cutting parameters	Vc=128m/min , fz=0.38mm/z , ap=0.2mm ae=0.5~10mm
Result of cutting	Hardstone : 74min/cutting edge,normal wear.



### H13 hardened steel die-casting mould

Parts	die-casting mould H13 hardened steel ( HRC48-51 )
Machining way	D21-Z2-L60 overhang BT40 dry rough face milling
Inserts type/Grade	APMT1135PDER-FM WS5130
Cutting parameters	Vc=148m/min , fz=0.44mm/z , ap=0.2mm ae=13mm
Result of cutting	Hardstone : 17min/cutting edge,abrasion and chipping , Foreignbrand D : 11min/cutting edge,heavily worn.



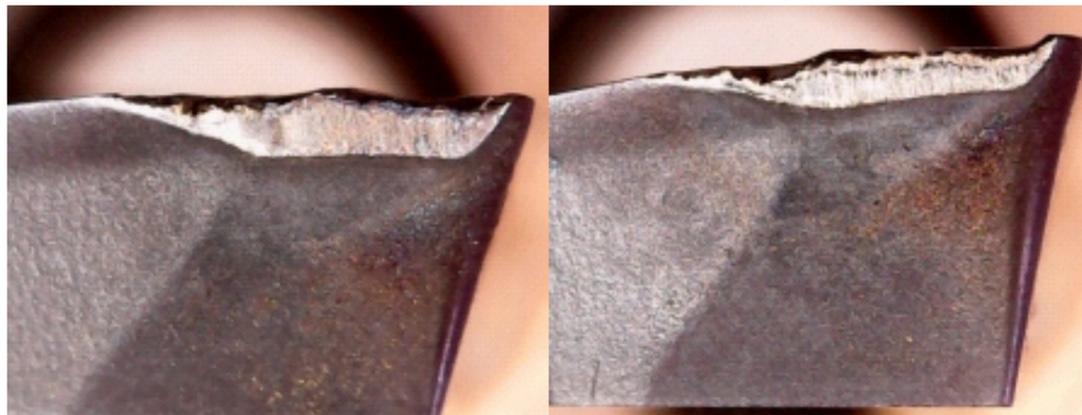
### Cr12 punch mould hole-milling

Parts	Cr12 Punch mould
Machining way	D30-Z2-L75 overhang BT40 dry rough hole-milling
Inserts type/Grade	RPMT1003MO-FM WS5130
Cutting parameters	Vc=170m/min , fz=0.89mm/z , ap=0.3mm
Result of cutting	Comparision under 58min/cutting edge,WS5130slight chipping , While foreign brand D heavily worn.



### Cr12MoV hardened steel punch mould

	Cr12MoV hardened alloy ( HRC58 ) punch mould
Machining way	D21-Z2-L86 overhang BT40 dry rough face milling
Inserts type/Grade	APMT1135PDER-FM WS5130
Cutting parameters	Vc=145m/min , fz=0.34mm/z , ap=0.12mm ae=13mm
Result of cutting	Hardstone : 7min/cutting edge,normal wear , Foreign brand D : 3min/cutting edge,normal wear.



WS5130



Brand D

## HARDSTONE CUTTING TOOLS MARKETING NETWORK

