

TOMEI DIAMOND

Products Guide

<http://www.tomeidiamond.co.jp>

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# PcBN

## Products Guide



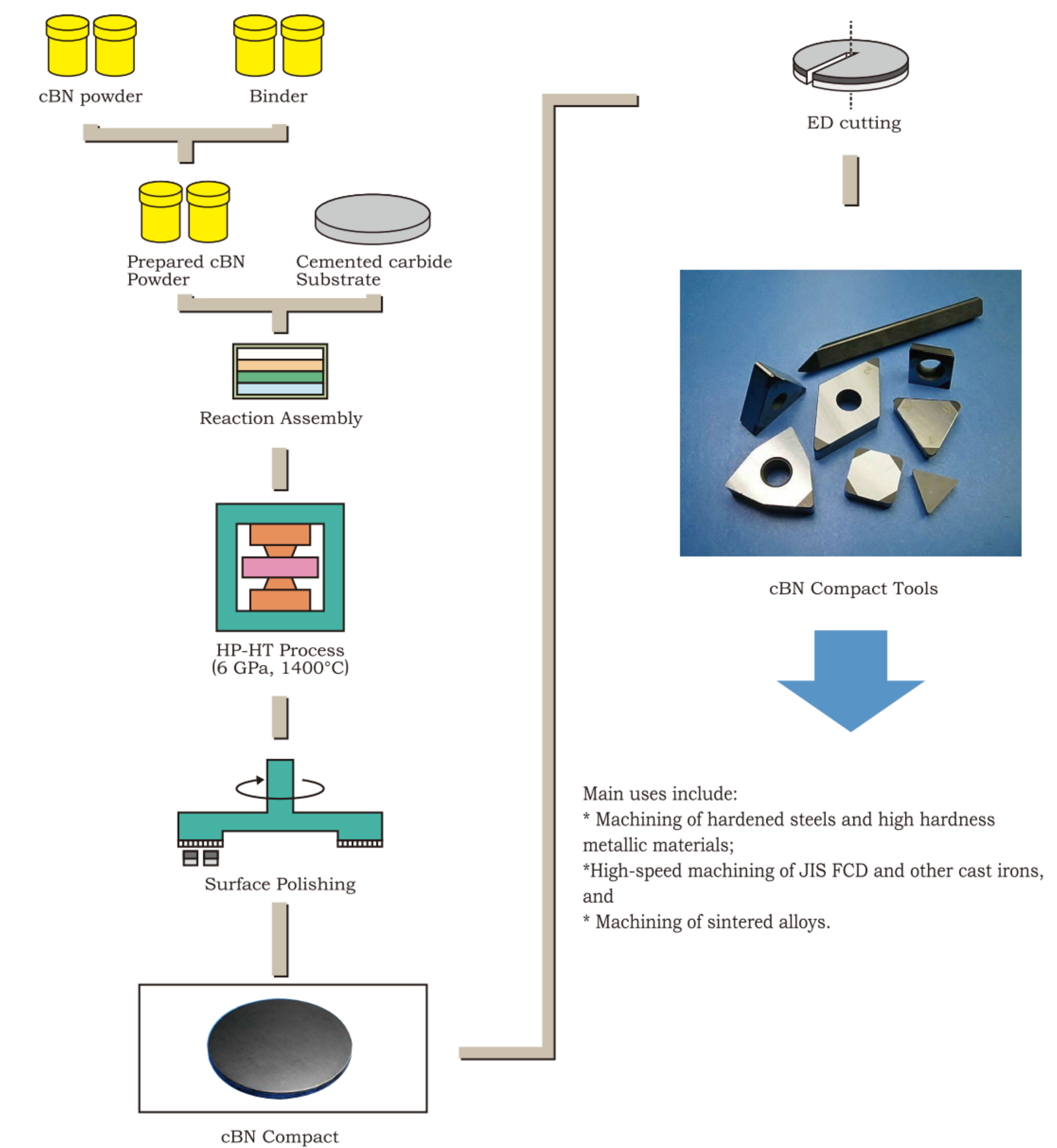


Cubic boron nitride,

often referred to briefly as cBN, is a synthetic substance that does not occur in nature but it is produced under high pressure and high pressure conditions just like synthetic or man-made diamonds.

cBN, which has a zinc-blende type crystal structure, is excellent in both hardness and heat conductivity, second only to diamond. It is even more stable at high temperatures up to 1,300°C than diamond, which begins to oxidize in the atmosphere around 700 °C. Also the substance is favored as an efficient abrasive for iron based works with which diamond cannot deal because of the inherent high reactivity.

PcBN Production Process



PcBN (Polycrystalline Cubic Boron Nitride)

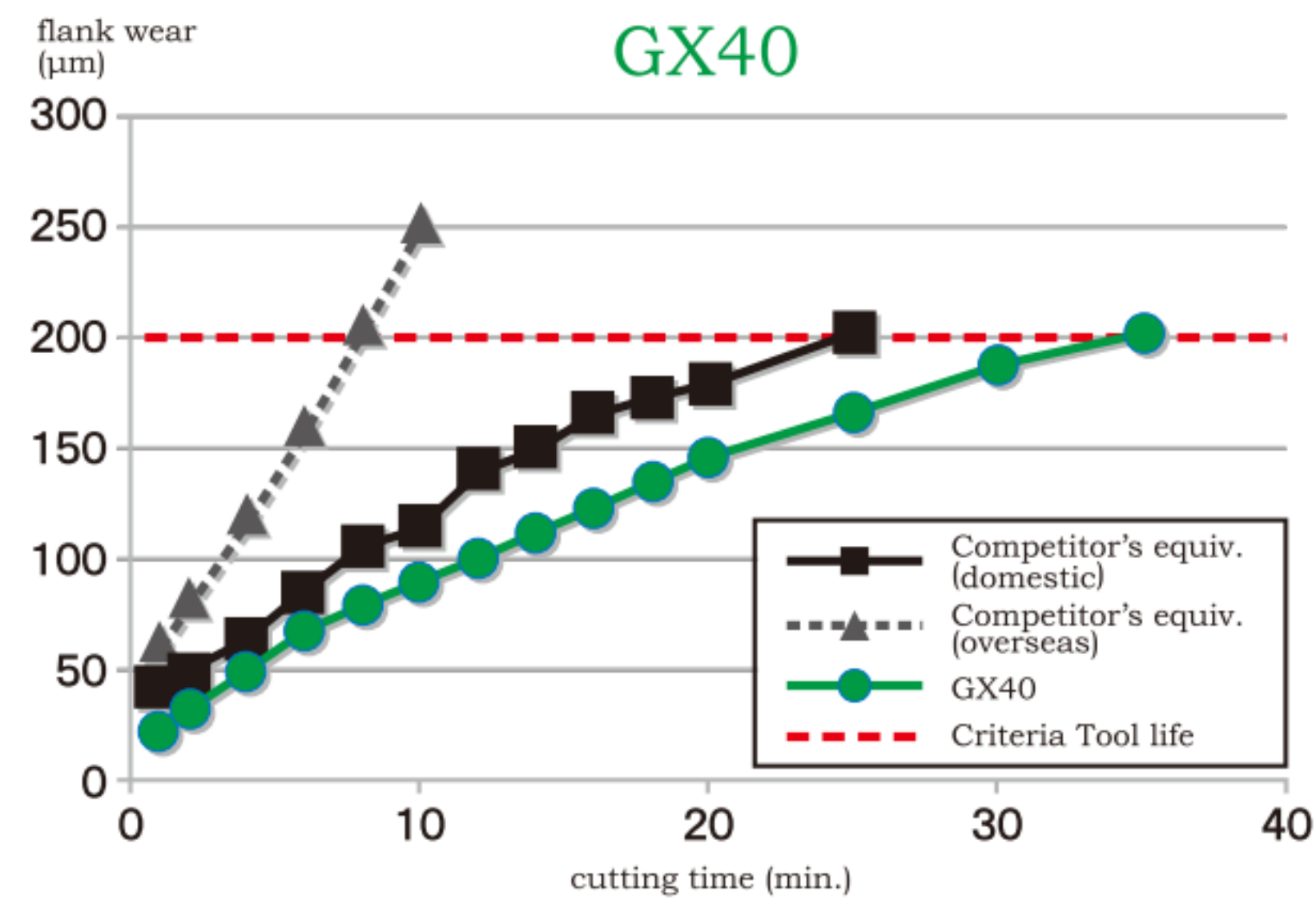
Product Code	Microstructure	Average cBN Part. Size	Features and Grade Adaptation
TBC-GX40		4 μm	<b>For the low- to high speed continuous machining of hardened steel</b> High in wear resistance with ceramic binder. Also applicable to the continuous machining of ductile cast iron.
TBC-FX50		1 μm	<b>For the light intermittent machining of hardened steel</b> Suitable for the continuous to light intermittent machining of hardened steel, with uniformly distributed minute cBN particles and ceramic binder. The minute cBN particles yield fine surface finish.
TBC-GX60		3 μm	<b>For general wide-ranging machining of hardened steel</b> Minute cBN particles and ceramic binder are uniformly distributed. Resistance for wear and chipping. are well coordinated.
TBC-GCX60		4 μm	<b>For wide-ranging machining of ductile cast irons</b> The proportion and size of cBN and ceramic binder are specifically controlled in order to achieve a well coordinated resistance for both wear and chipping.
TBC-GX80		3 μm	<b>For general machining for gray cast iron and heat resistant steel</b> A high proportion of cBN particles is uniformly mixed with ceramic binder. Well adapted for the high speed cutting of FC gray cast irons and machining of heat resistant alloy. Also applicable to high speed fraise milling tool.
TBC-GX90		4 μm	<b>For common, incl. interrupted, cutting of gray cast iron and sintered alloy</b> Close packed and high proportion of cBN is uniformly mixed with metallic binder. Effective for high speed cutting of JIS FC cast irons and machining of sintered alloy. As an upper grade to GX80, this can be used for interrupted machining. Also applicable to high speed fraise milling tool.
TBC-350		10 μm	<b>For heavy cutting of hardened steels and sintered alloy</b> Composed of sintered cBN particles with metallic binder. Effective for interrupted and heavy cutting processes of hardened steel.



## House Test Results of particular cBN grades

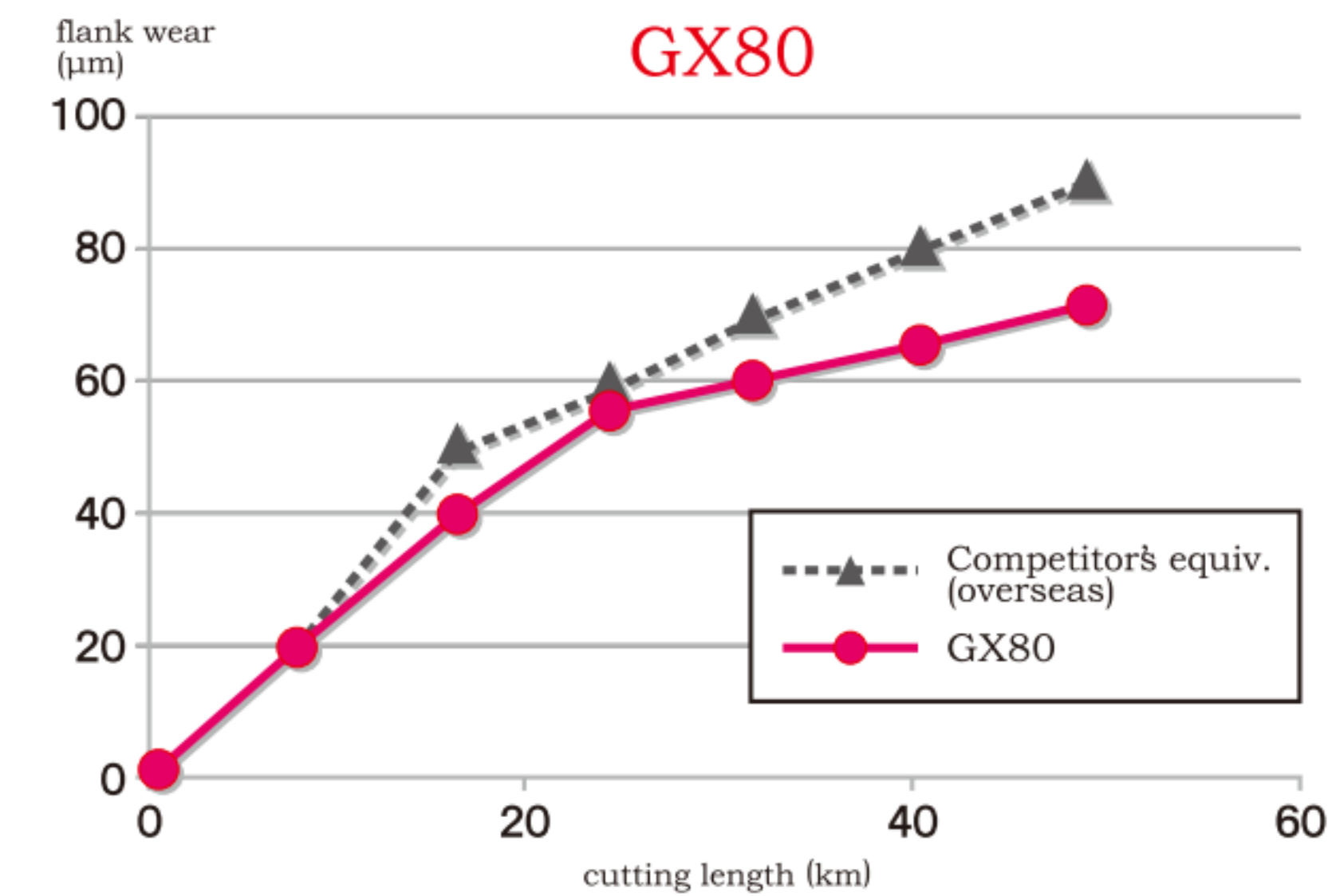
GX40, FX50 and GX60: - Performance in the cutting of hardened steel -

GX80 and GX90 : - Performance in the cutting of cast iron



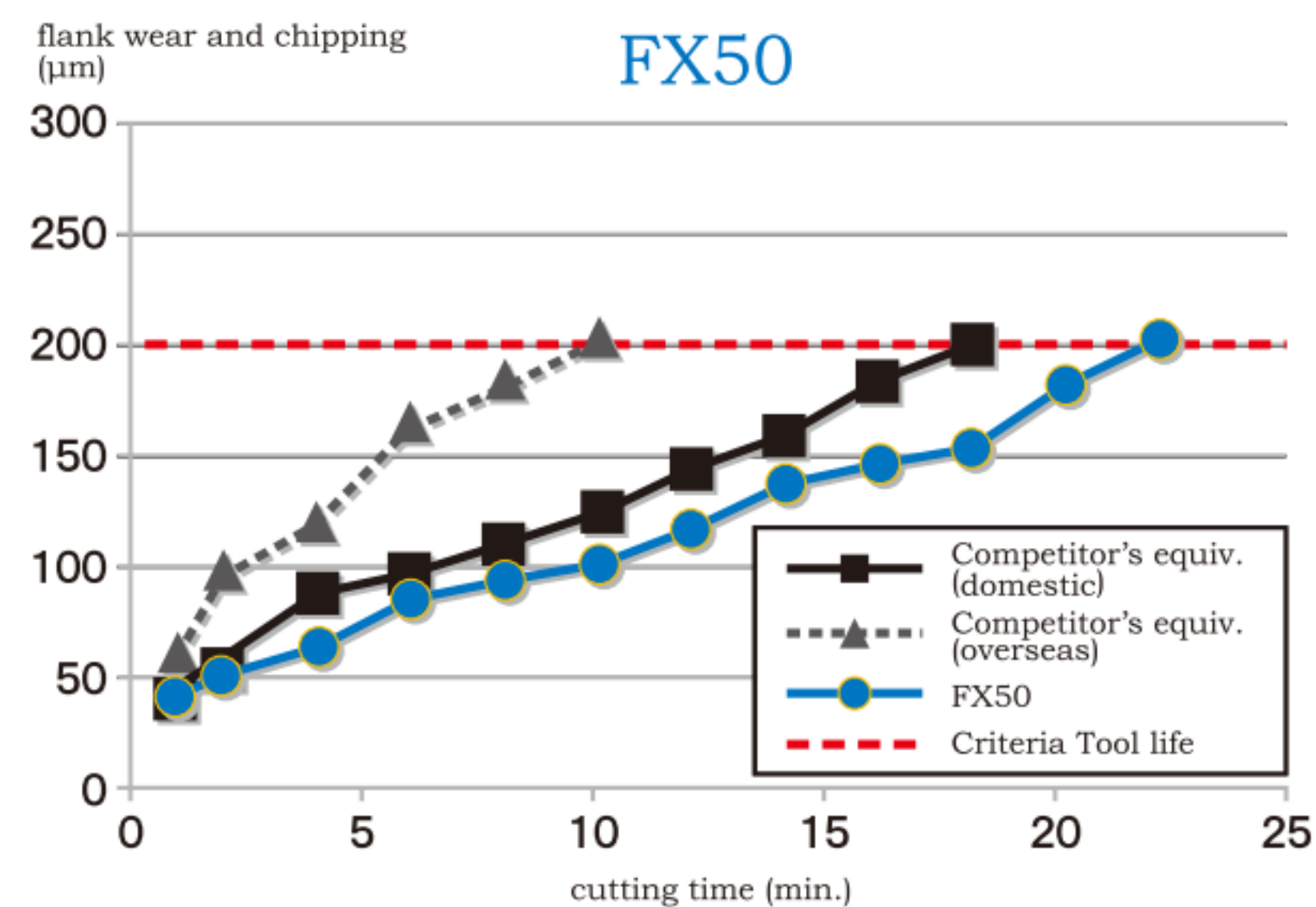
**\*\* Test Parameters \*\***  
 Work material : SCM415(58-62HRC)  
 Cutting speed  $v_c$  : 150m/min.  
 Depth of cut  $a_p$  : 0.25mm  
 Feed  $f$  : 0.1mm/rev.  
 Dry mode  
 Tool insert style : CNGA120408-2

**\*\* Relative results: \*\***  
 GX40 showed a 1.4 times high wear resistance to the competitors' equivalents.



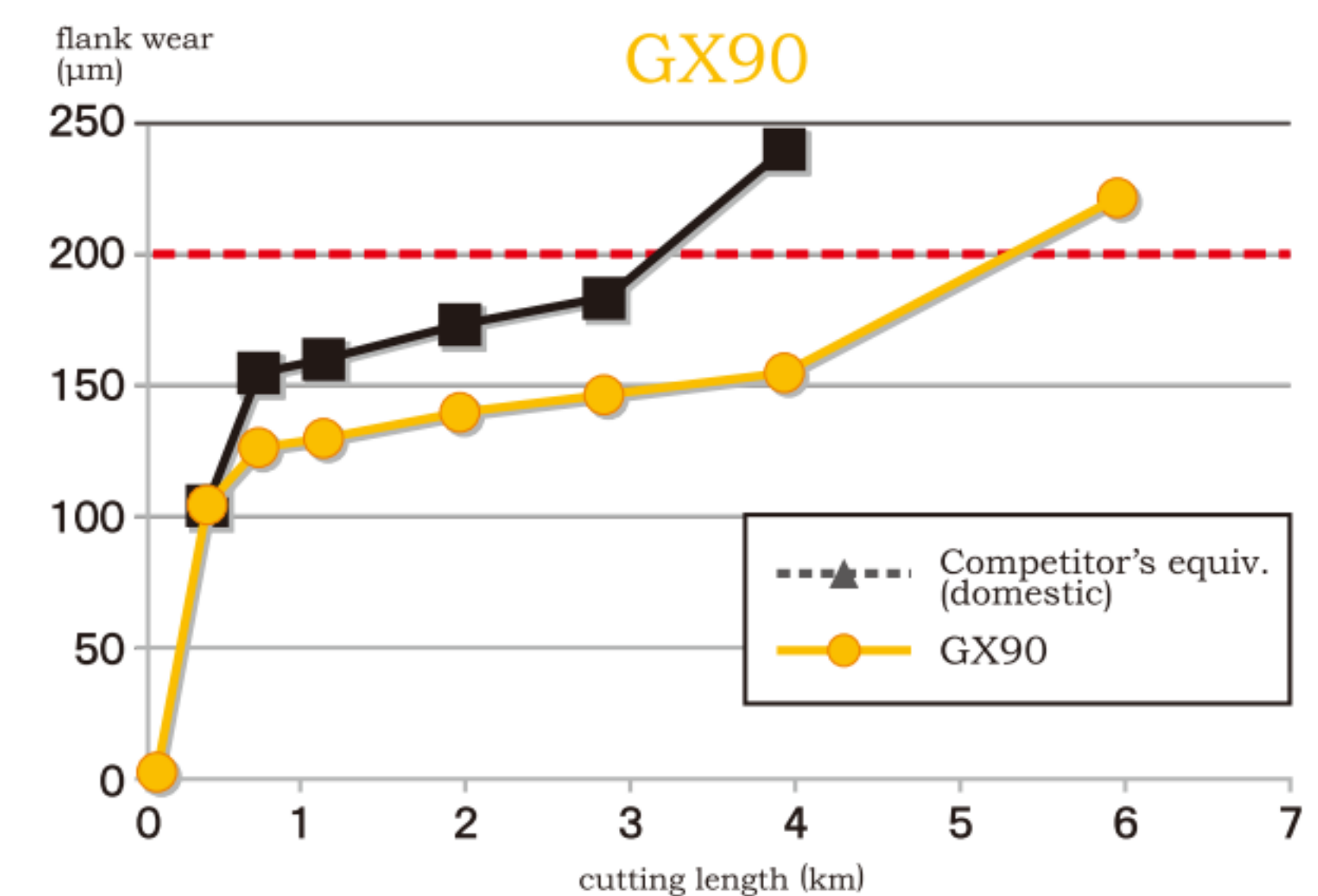
**\*\* Test Parameters \*\***  
 Work material: FC250  
 Cutting speed  $v_c$ : 800m/min.  
 Depth of cut  $a_p$ : 0.2 mm.  
 Feed  $f$  : 0.15 mm/rev.  
 Wet mode  
 Tool insert style: CNGA120408-2

**\*\*Relative results: \*\***  
 GX80 showed a 1.3 times high wear resistance to the competitors' equivalents.



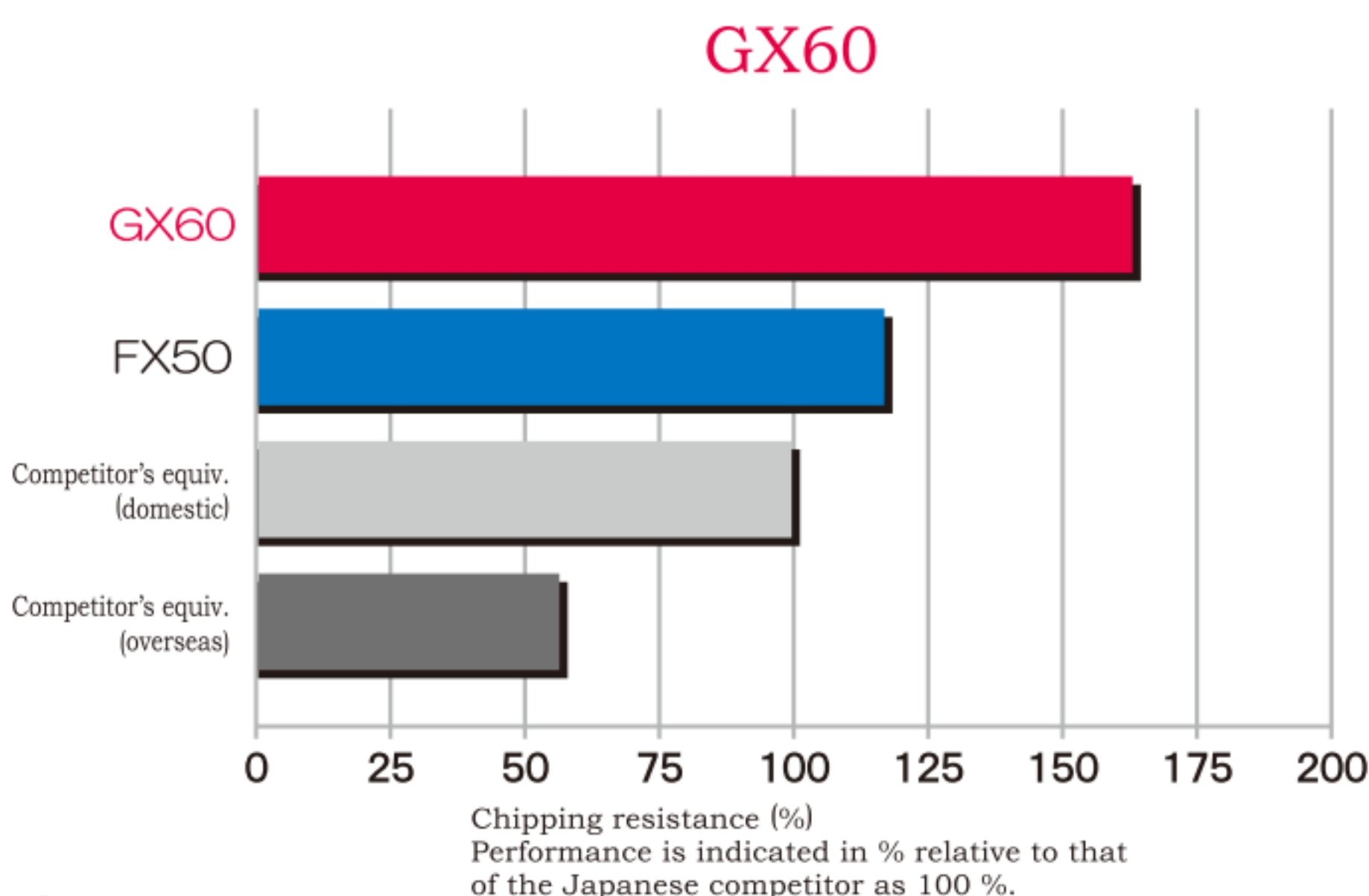
**\*\* Test Parameters \*\***  
 Work material : SCM415(58-62HRC)  
 Cutting speed  $v_c$  : 100m/min.  
 Depth of cut  $a_p$  : 0.25 mm  
 Feed  $f$  : 0.1mm/rev.  
 Dry mode  
 Tool insert style : CNGA120408-2

**\*\* Relative results: \*\***  
 FX50 showed a 1.2 times high wear resistance to the competitors' equivalents.



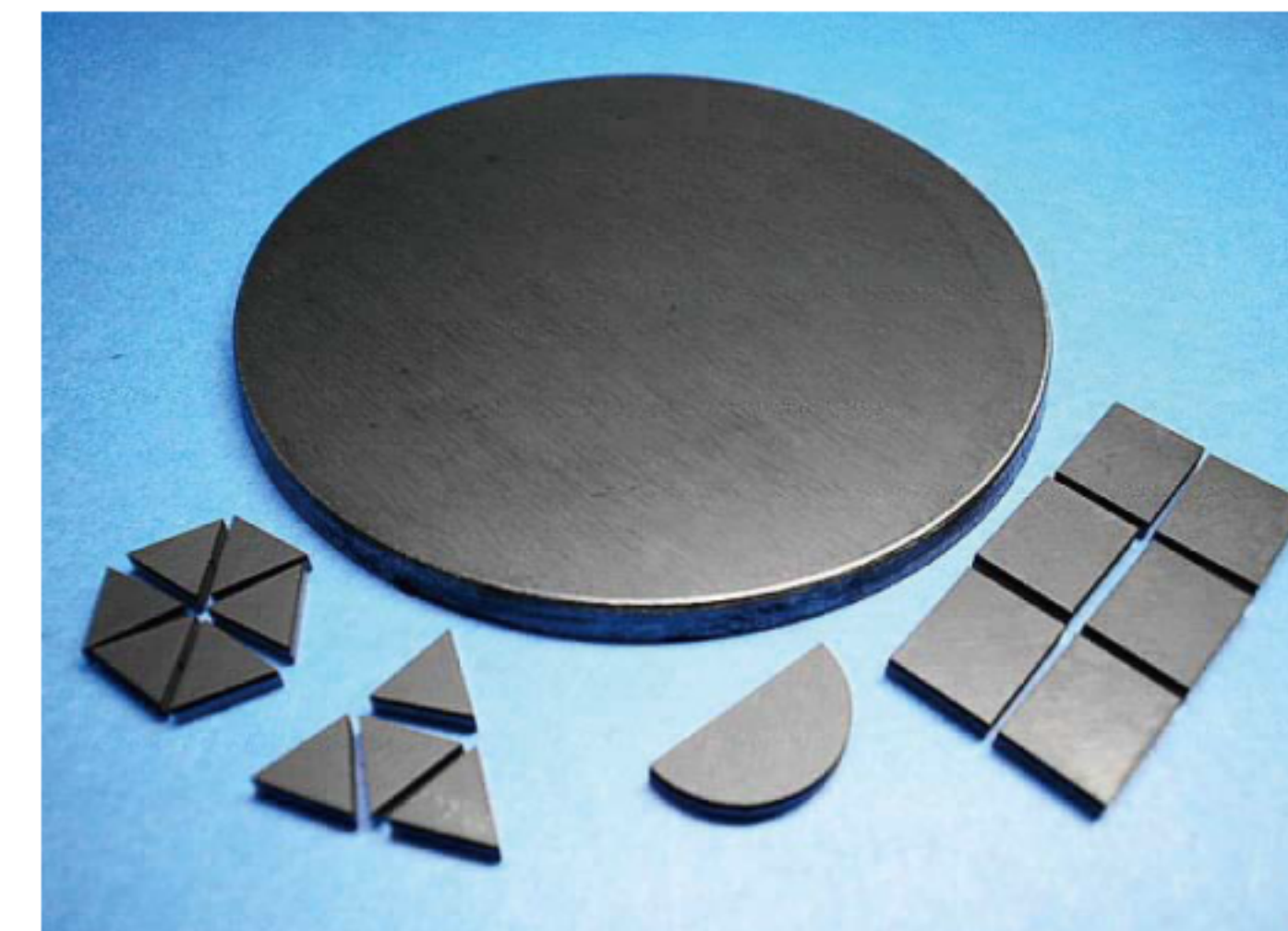
**\*\* Test Parameters \*\***  
 Work material: FC250  
 Cutting speed  $v_c$ : 400m/min.  
 Depth of cut  $a_p$ : 0.1 mm.  
 Feed  $f$  : 0.2 mm/rev.  
 Dry mode  
 Tool insert style: CNGA120408-2

**\*\* Relative results: \*\***  
 GX90 showed a 1.6 times high wear resistance to the competitors' equivalents.



**\*\* Test Parameters \*\***  
 Work material: SCM415 4V (58-62HRC)  
 Cutting speed  $v_c$ : 100m/min.  
 Depth of cut  $a_p$ : 0.25 mm  
 Feed  $f$  : 0.1mm/rev.  
 Dry mode  
 Tool insert style: CNGA120408-2

**\*\* Relative results: \*\***  
 GX60 showed a 1.6 times high wear resistance to the competitors' equivalents.

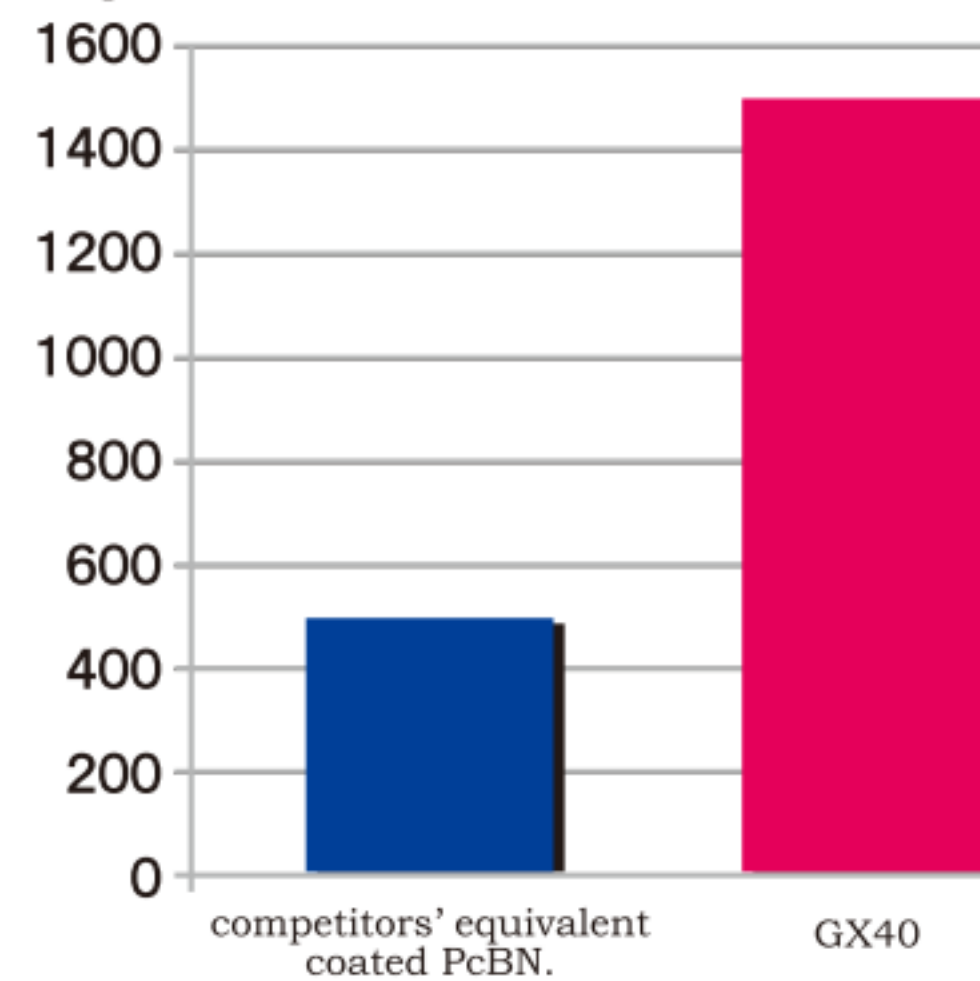




## Processing with a PCBN insert: Instances

### (1) Automotive bearing machining

Number of pieces worked

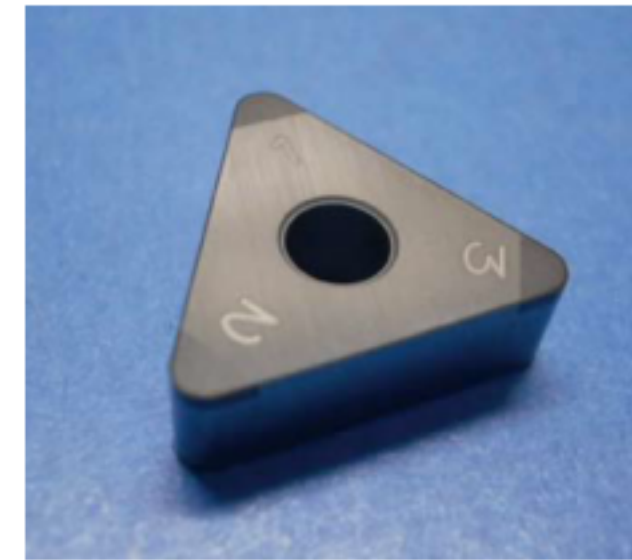


**\*\* Test Parameters \*\***

Work material: SCM415 (62HRC)  
Cutting speed  $v_c$ : 130m/min.  
Depth of cut  $a_p$ : 0.15mm.  
Feed  $f$ : 0.25 mm/rev.  
Wet mode  
Criteria: Surface roughness  
Tool insert style: TNGA 1 60412-3

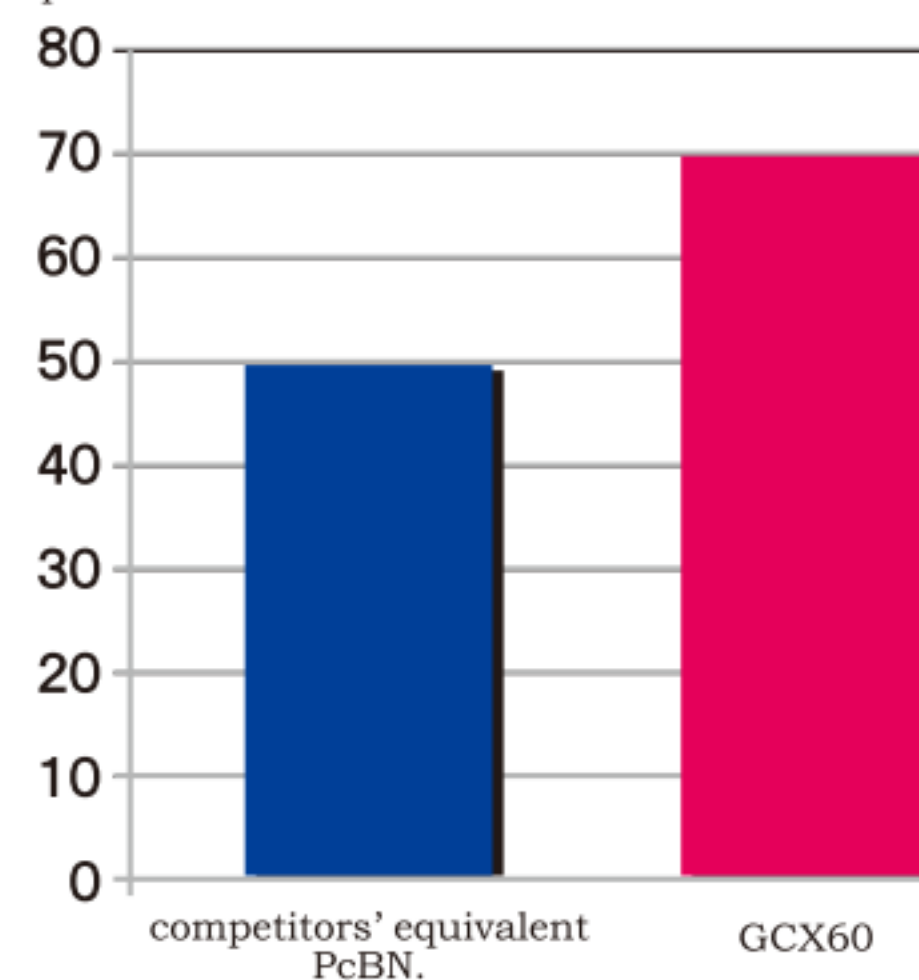
**\*\* Relative results: \*\***

GX40 could process 3 times as many pieces as the competitors' equivalent coated PcBN.



### (2) Pinion cage machining

Number of pieces worked

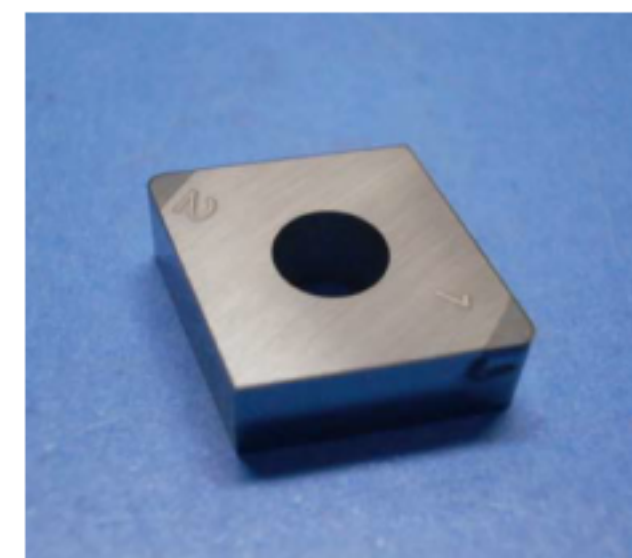


**\*\* Test Parameters \*\***

Work material: FCD450  
Cutting speed  $v_c$ : 200m/min.  
Depth of cut  $a_p$ : 0.5mm.  
Feed  $f$ : 0.20 mm/rev.  
Wet mode  
Criteria: Surface roughness  
Tool insert style: CNGA 1 20408-2

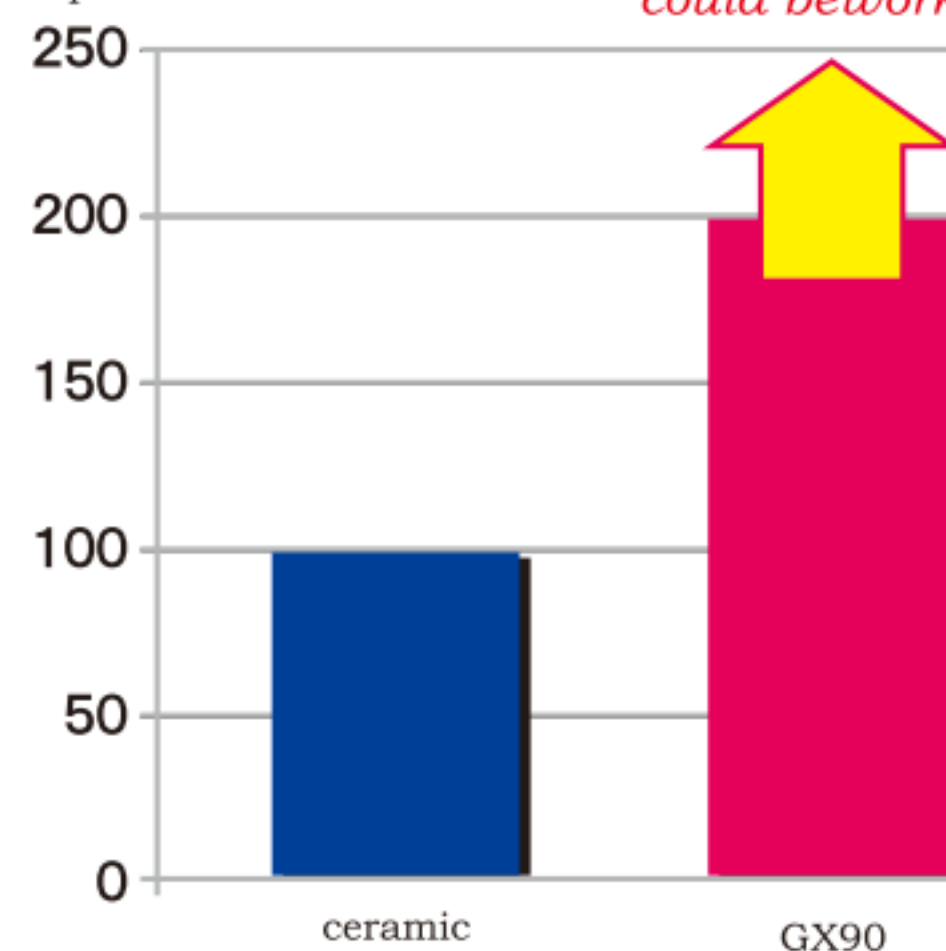
**\*\* Relative results: \*\***

GCX60 could process 1.4 times as many pieces as the competitors' equivalent PcBN.



### (3) Turbine machining

Number of pieces worked



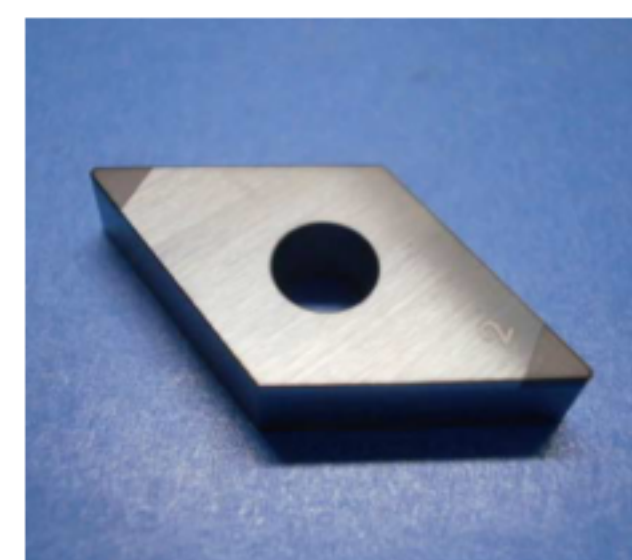
**\*\* Test Parameters \*\***

Work material: High Si ductile cast iron  
Cutting speed  $v_c$ : 140 m/min.  
Depth of cut  $a_p$ : 0.2 mm.  
Feed  $f$ : 0.20 mm/rev.  
Wet mode  
Criteria: Surface roughness  
Tool insert style: DNGA 1 50404-2

**\*\* Relative results: \*\***

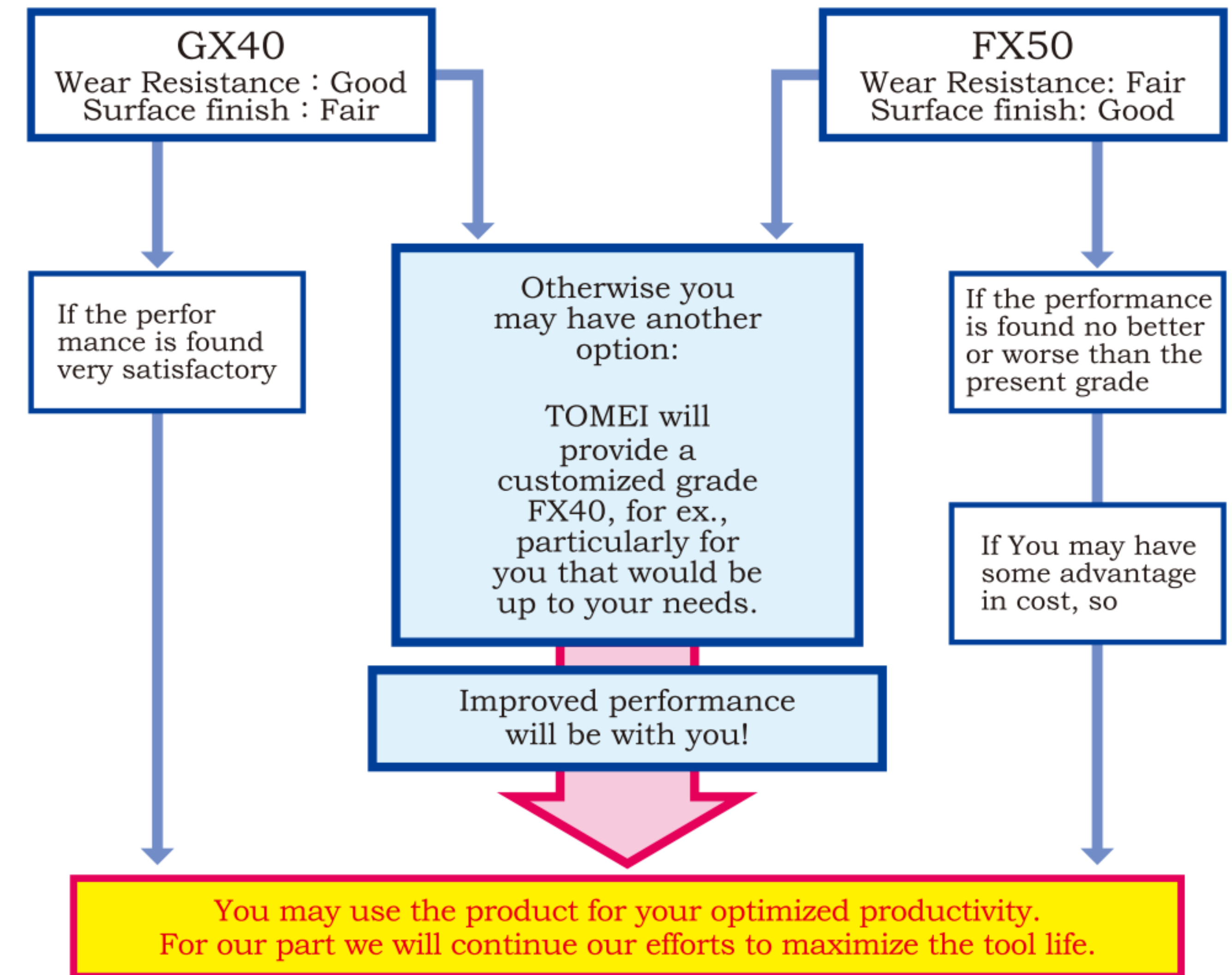
GX90 could process more than twice as many pieces as that of ceramic.

Processing steps to be decreased with the achievable surface roughness improvement



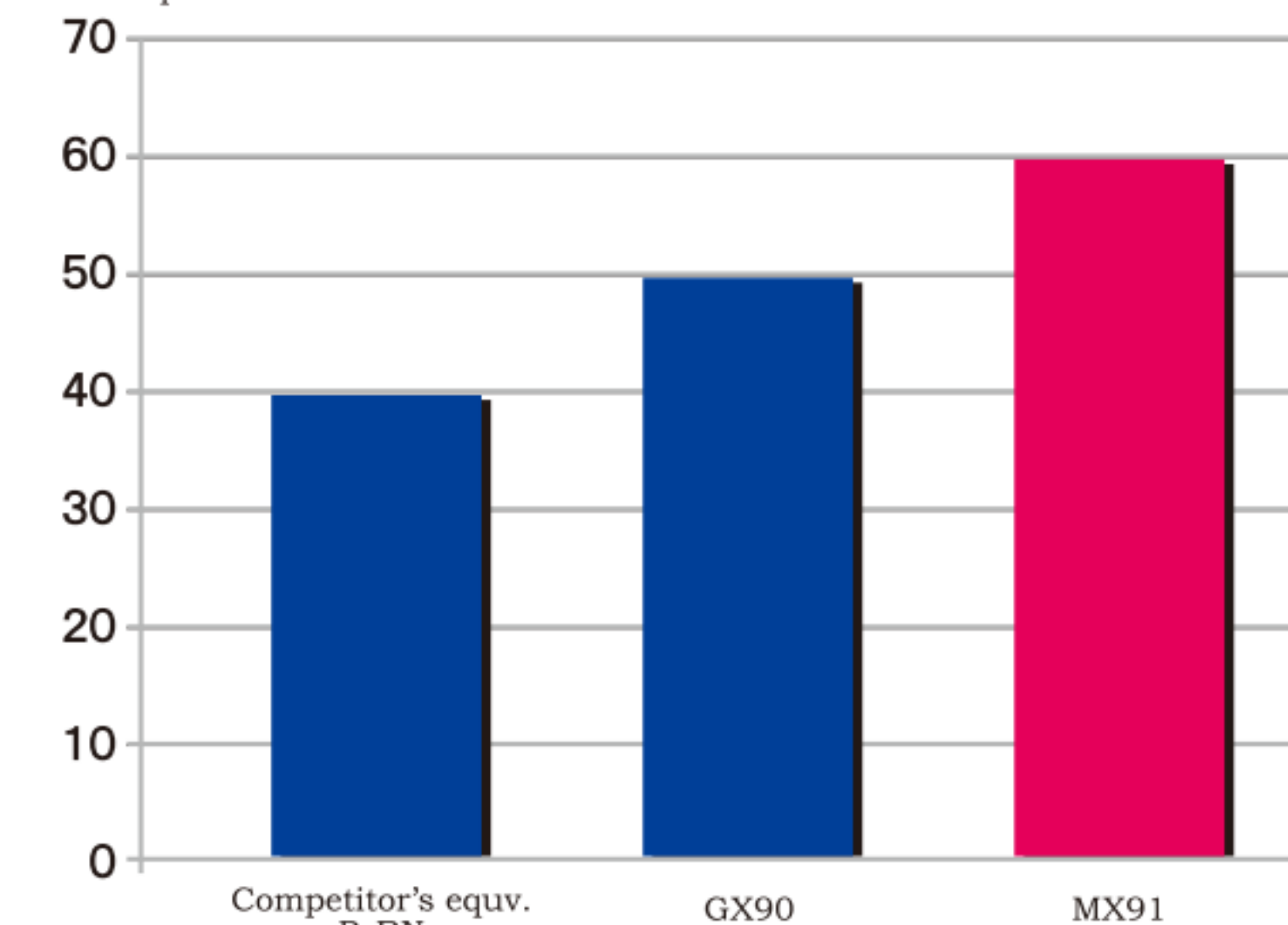
## Proposal of a customized grade for your particular uses ...

As a manufacturer of raw abrasive material may we TOMEI help you with a customized grade for saving your machining cost.



### Results of a test machining of a valve seat

No. of worked pieces



**\*\* Test Parameters \*\***

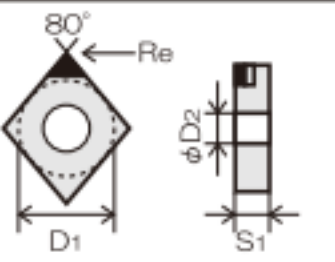
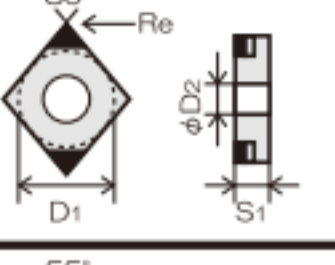
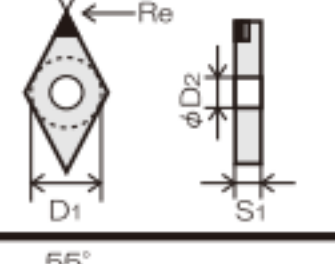
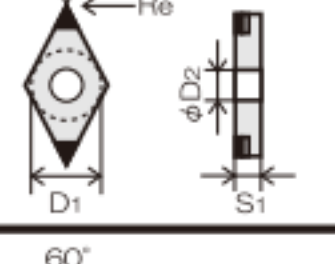
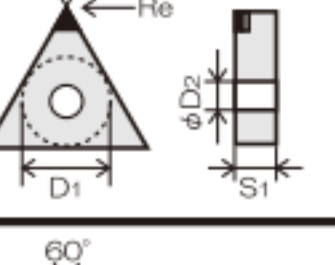
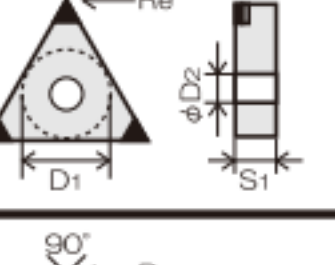
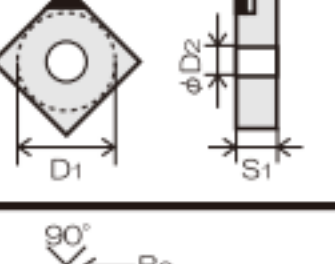
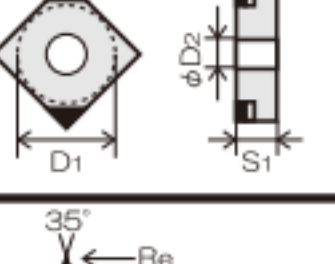
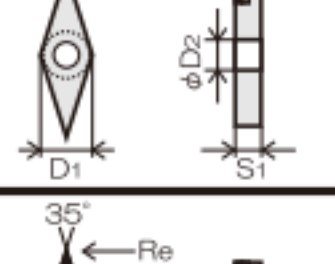
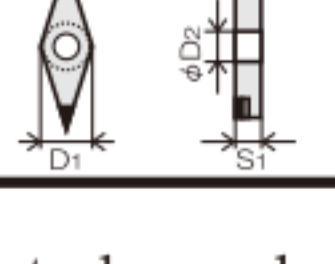
Work material : Sintered alloy  
Speed  $v_c$  : 50 m/min.  
Depth of cut  $a_p$  : 0.3mm  
Mode : wet  
Tool Life criteria :  
finished surface roughness level  
Tool type : special tool

**\*\* Relative Results \*\***

MX91, a customized grade, achieved a tool life of 1.5 times as many worked pieces, at a 25%-off reduced tooling cost.



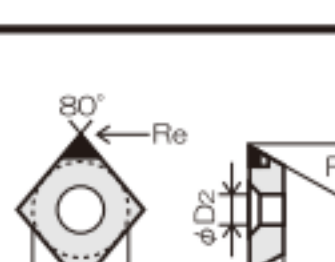
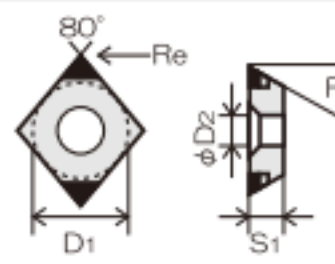
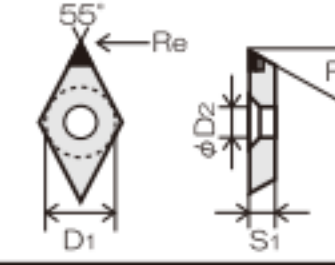
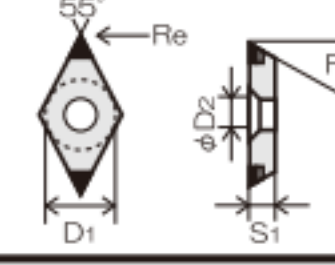
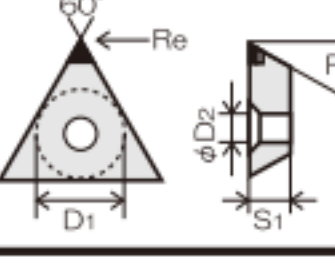
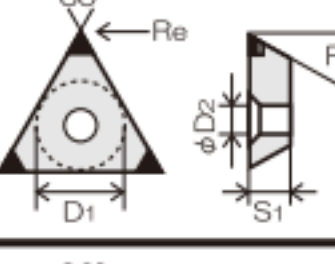
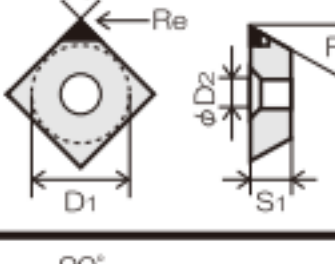
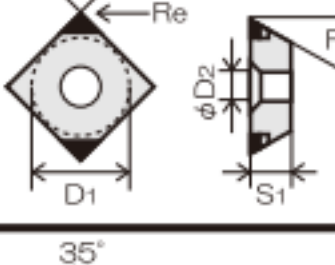
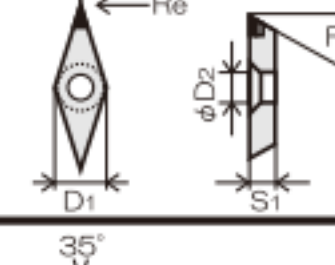
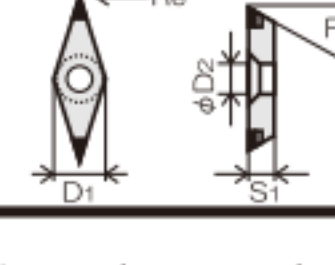
Typical tool insert styles available - negative

Geometry	ISO type designation	No. of cutting corners	D <sub>1</sub>	S <sub>1</sub>	Re	D <sub>2</sub>
	CNGA120404-1	1	12.7	4.76	0.4	5.16
	CNGA120408-1	1	12.7	4.76	0.8	5.16
	CNGA120412-1	1	12.7	4.76	1.2	5.16
	CNGA120404-2	2	12.7	4.76	0.4	5.16
	CNGA120408-2	2	12.7	4.76	0.8	5.16
	CNGA120412-2	2	12.7	4.76	1.2	5.16
	DNGA150404-1	1	12.7	4.76	0.4	5.16
	DNGA150408-1	1	12.7	4.76	0.8	5.16
	DNGA150412-1	1	12.7	4.76	1.2	5.16
	DNGA150404-2	2	12.7	4.76	0.4	5.16
	DNGA150408-2	2	12.7	4.76	0.8	5.16
	DNGA150412-2	2	12.7	4.76	1.2	5.16
	TNGA160404-1	1	9.525	4.76	0.4	3.81
	TNGA160408-1	1	9.525	4.76	0.8	3.81
	TNGA160412-1	1	9.525	4.76	1.2	3.81
	TNGA160404-3	3	9.525	4.76	0.4	3.81
	TNGA160408-3	3	9.525	4.76	0.8	3.81
	TNGA160412-3	3	9.525	4.76	1.2	3.81
	SNGA120404-1	1	12.7	4.76	0.4	5.16
	SNGA120408-1	1	12.7	4.76	0.8	5.16
	SNGA120412-1	1	12.7	4.76	1.2	5.16
	SNGA120404-2	2	12.7	4.76	0.4	5.16
	SNGA120408-2	2	12.7	4.76	0.8	5.16
	SNGA120412-2	2	12.7	4.76	1.2	5.16
	VNGA160404-1	1	9.525	4.76	0.4	3.81
	VNGA160408-1	1	9.525	4.76	0.8	3.81
	VNGA160412-1	1	9.525	4.76	1.2	3.81
	VNGA160404-2	2	9.525	4.76	0.4	3.81
	VNGA160408-2	2	9.525	4.76	0.8	3.81
	VNGA160412-2	2	9.525	4.76	1.2	3.81

The list above shows typical examples alone, so please contact us for any type not given here or a product with another number of cutting corners, edge length or other parameters, honing, etc.  
We accept customized construction inserts. Used tooltip of a customized construction may be renewed with a fresh insert.



Typical tool tip types available - positive

geometry	ISO type designation	No. of cutting corners	R	D <sub>1</sub>	S <sub>1</sub>	D <sub>2</sub>
	CCGW0602**-1	1	7°	6.35	2.38	2.8
	CCGW09T3**-1	1	7°	9.525	3.97	4.4
	CPGW0802**-1	1	11°	7.94	2.38	3.5
	CPGW0903**-1	1	11°	9.525	3.18	4.5
	CCGW09T3**-2	2	7°	9.525	3.97	4.4
	CPGW0802**-2	2	11°	7.94	2.38	3.5
	CPGW0903**-2	2	11°	9.525	3.18	4.5
	DCGW0702**-1	1	7°	6.35	2.38	2.8
	DCGW11T3**-1	1	7°	9.525	3.97	4.4
	DCGW11T3**-2	2	7°	9.525	3.97	4.4
	TPGW0802**-1	1	11°	4.76	2.38	2.4
	TPGW0902**-1	1	11°	5.56	2.38	2.9
	TPGW1103**-1	1	11°	6.35	3.18	3.4
	TPGW0902**-3	3	11°	5.56	2.38	2.9
	TPGW1103**-3	3	11°	6.35	3.18	3.4
	TPGW1604**-3	3	11°	9.525	4.76	4.8
	SPGW09T3**-1	1	11°	9.525	3.97	4.4
	SPEA1204**-1	1	11°	12.7	4.76	5.5
	SPGW09T3**-2	1	11°	9.525	3.97	4.4
	SPEA1204**-2	1	11°	12.7	4.76	5.5
	VBGW1103**-1	1	5°	6.35	3.18	2.9
	VBGW1604**-1	1	5°	9.525	4.76	4.4
	VBGW1604**-2	2	5°	9.525	4.76	4.4

The list above shows typical examples alone, so please contact us for any type not given here or a product with another number of cutting corners, edge length or other parameters, honing, etc.  
Customized shapes are also available. Used tooltip of a customized shape may be renewed with a fresh insert. Please contact us, again, for the diameter and shape of screwholes.

