

TurnLine

**T515**

[www.tungaloy.com](http://www.tungaloy.com)

Tungaloy Report No. 433-G

T515

## New grade for cast iron turning





ACCELERATED MACHINING



TurnLine

**T515**

TUNGALOY



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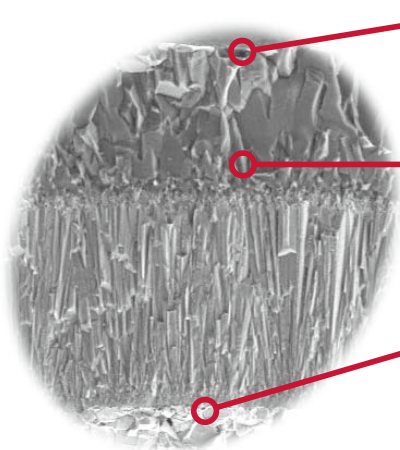
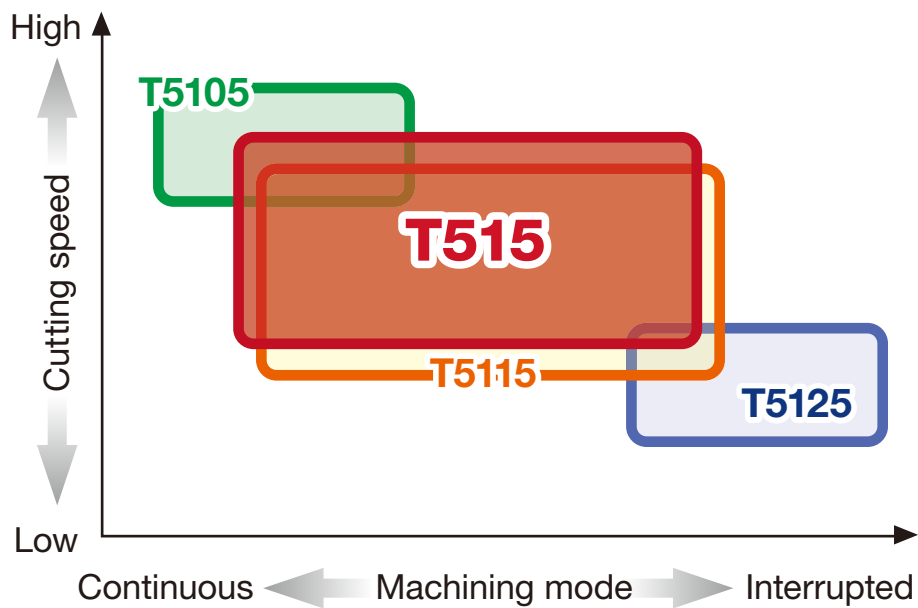
**Versatile grade** for high-speed turning of cast iron

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[www.tungaloy.com](http://www.tungaloy.com)

## Versatile grade for cast iron turning at high speed, complementing T5115


### APPLICATION AREA



**Smooth surface reduces chipping and chip welding!**  
PremiumTec, smooth surface technology, improves surface roughness.

**Excellent wear resistance in high-speed cutting!**  
Al<sub>2</sub>O<sub>3</sub> layer is 1.7 times thicker than the conventional coating.

**Incredible chipping and fracture resistance!**  
Strong adhesion between coating and substrate delivers remarkable toughness.

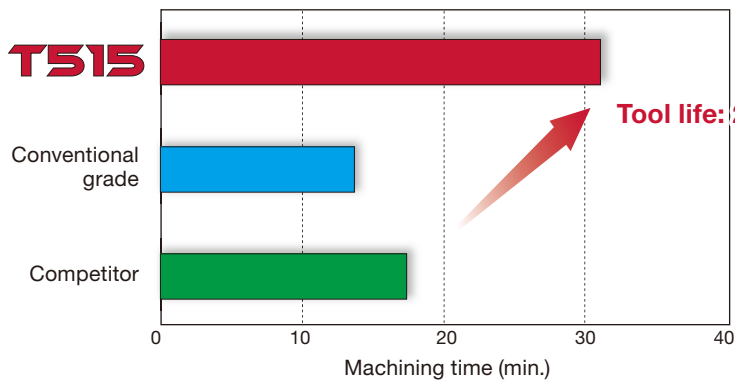
Application	Grade	Specific gravity	Substrate		Coating layer	
			Hardness (HRA)	T.R.S. (GPa)	Main Composition	Thickness (µm)
	T515	14.8	91.5	2.7	Continuously formed columnar crystal TiCN + Al <sub>2</sub> O <sub>3</sub>	16
	T5115	14.8	91.5	2.7	Continuously formed columnar crystal TiCN + Al <sub>2</sub> O <sub>3</sub>	16

## CUTTING PERFORMANCE

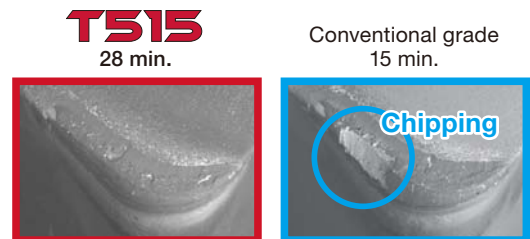
T515 achieves stable, long tool life in both continuous and interrupted machining!

**K** Grey cast iron  
(FC200 / GG20)

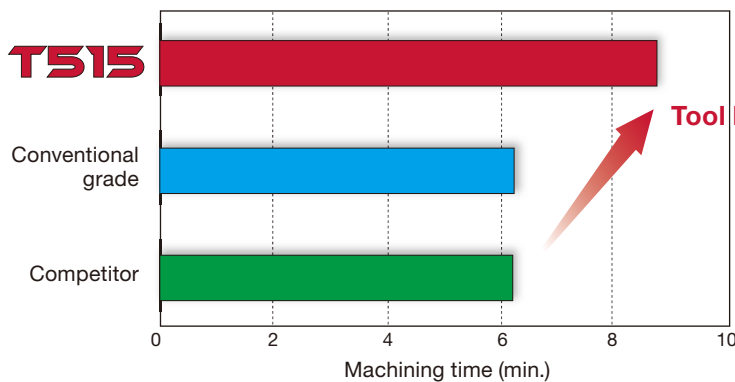
**Excellent wear resistance  
in continuous cutting at high speed!**



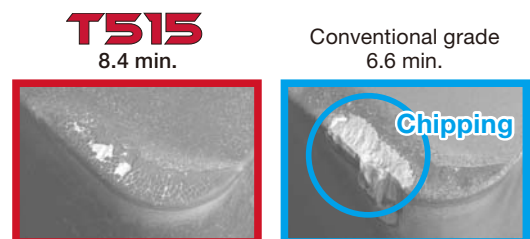
Insert : CNMA120408  
Cutting speed :  $V_c = 700$  m/min  
Feed :  $f = 0.3$  mm/rev  
Machining : Continuous cutting  
Coolant : Wet



**Incredible chipping resistance  
in interrupted cutting!**

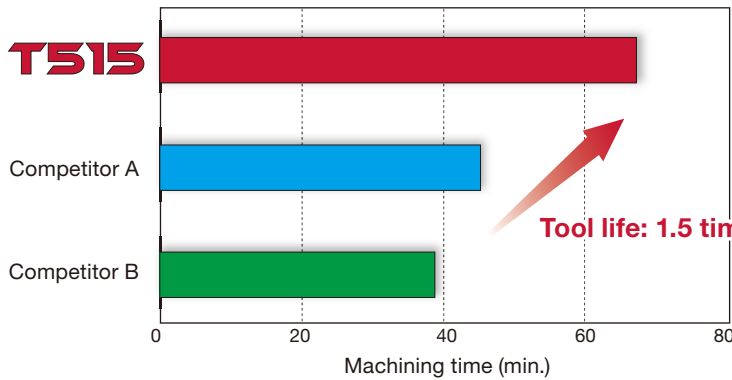


Insert : CNMA120408  
Cutting speed :  $V_c = 400$  m/min  
Feed :  $f = 0.35$  mm/rev  
Machining : Interrupted cutting  
Coolant : Wet



## FC200 Continuous internal machining

**K** Grey cast iron  
(FC200 / GG20)

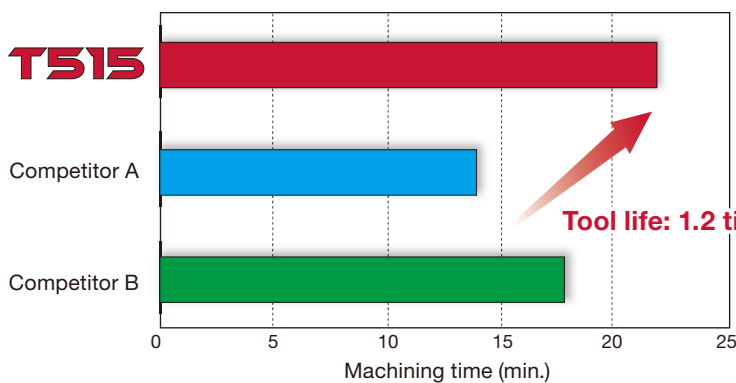


Insert : CCMT09T308-  
Cutting speed :  $V_c = 300$  m/min  
Feed :  $f = 0.2$  mm/rev  
Depth of cut :  $a_p = 1.5$  mm  
Machining : Continuous Internal cutting  
Coolant : Wet

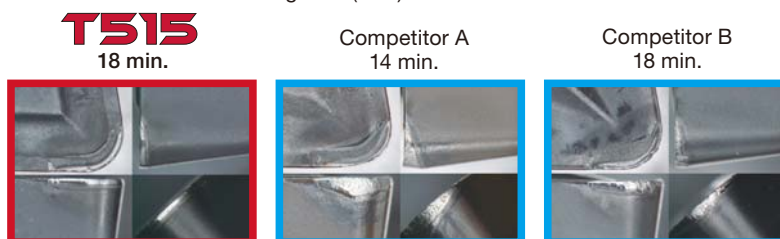


## FCD600 Continuous internal machining

**K** Ductile iron  
(FCD600 / GGG60)



Insert : CCMT09T308-  
Cutting speed :  $V_c = 200$  m/min  
Feed :  $f = 0.2$  mm/rev  
Depth of cut :  $a_p = 1.5$  mm  
Machining : Continuous Internal cutting  
Coolant : Wet



## STANDARD CUTTING CONDITIONS

### For negative inserts

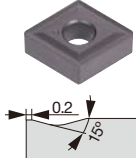
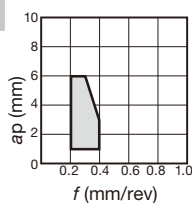
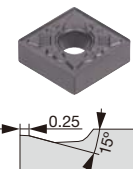
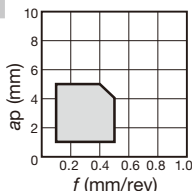
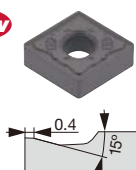
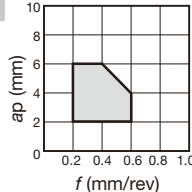
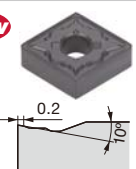
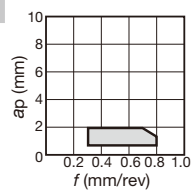

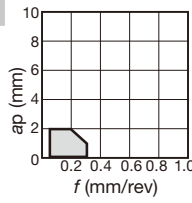
Chipbreaker	Grades	Corner radius $r_{\epsilon}$	Depth of cut $a_p$ (mm)	Feed $f$ (mm/rev)	Cutting speed: $V_c$ (m/min)	
					Grey cast iron	Ductile cast iron
CM	T515	0.8	1.0 - 5.0	0.15 - 0.40	150 - 700	150 - 300
	T515	1.2	1.0 - 5.0	0.15 - 0.50	150 - 700	150 - 300
CH	T515	0.4	2.0 - 6.0	0.10 - 0.30	150 - 700	150 - 300
	T515	0.8	2.0 - 6.0	0.20 - 0.45	150 - 700	150 - 300
	T515	1.2	2.0 - 6.0	0.20 - 0.65	150 - 700	150 - 300
All-round	T515	0.4	1.0 - 6.0	0.20 - 0.30	150 - 700	150 - 300
	T515	0.8	1.0 - 6.0	0.20 - 0.50	150 - 700	150 - 300
	T515	1.2	1.0 - 6.0	0.20 - 0.50	150 - 700	150 - 300
	T515	1.6	1.0 - 6.0	0.30 - 0.50	150 - 700	150 - 300
Fiat-top	T515	0.8	0.05 - 2.0	0.20 - 0.45	150 - 700	150 - 300
	T515	1.2	0.05 - 2.0	0.30 - 0.80	150 - 700	150 - 300

### For positive insert

Chipbreaker	Grades	Corner radius $r_{\epsilon}$	Depth of cut $a_p$ (mm)	Feed $f$ (mm/rev)	Cutting speed: $V_c$ (m/min)	
					Grey cast iron	Ductile cast iron
CM	T515	0.4	0.05 - 2.0	0.05 - 0.2	150 - 700	150 - 300
	T515	0.8	0.05 - 2.0	0.05 - 0.3	150 - 700	150 - 300
	T515	1.2	0.05 - 2.0	0.05 - 0.3	150 - 700	150 - 300

## INSERTS - NEGATIVE TYPE

### Rhombic , 80°

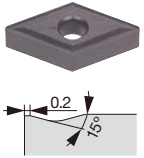
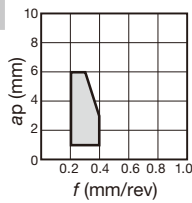
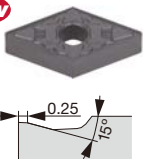
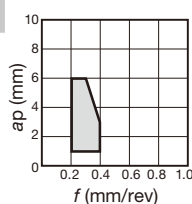
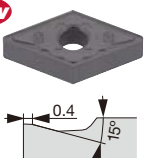
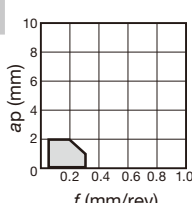

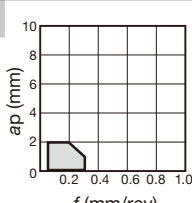
Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius		
	Appearance (Cross section)	$f - a_p$		Coating						
				T515						
				$\phi d$	s	$\phi d1$	$r\epsilon$			
Medium cutting	<b>All-round</b> 		CNMG120404	✓	12.7	4.76	5.16	0.4		
			*CNMG120408	✓	12.7	4.76	5.16	0.8		
			CNMG120412	✓	12.7	4.76	5.16	1.2		
			CNMG120416 <b>New</b>	✓	12.7	4.76	5.16	1.6		
			CNMG160612 <b>New</b>	✓	15.875	6.35	6.35	1.2		
			CNMG160616 <b>New</b>	✓	15.875	6.35	6.35	1.6		
			CNMG190612 <b>New</b>	✓	19.05	6.35	7.93	1.2		
			CNMG190616 <b>New</b>	✓	19.05	6.35	7.93	1.6		
			<b>CM</b> 		CNMG120408-CM	✓	12.7	4.76	5.16	0.8
					*CNMG120412-CM	✓	12.7	4.76	5.16	1.2
Medium to Heavy cutting	<b>CH</b> 		*CNMG120408-CH	✓	12.7	4.76	5.16	0.8		
			CNMG120412-CH	✓	12.7	4.76	5.16	1.2		
Finishing to medium cutting	<b>SW (Wiper)</b> 		*CNMG120408-SW	✓	12.7	4.76	5.16	0.8		
			CNMG120412-SW	✓	12.7	4.76	5.16	1.2		
Finishing to medium cutting	<b>- (Flat-top)</b> 		*CNMA120408	✓	12.7	4.76	5.16	0.8		
			CNMA120412	✓	12.7	4.76	5.16	1.2		
			CNMA160612 <b>New</b>	✓	15.875	6.35	6.35	1.2		
			CNMA160616 <b>New</b>	✓	15.875	6.35	6.35	1.6		
			CNMA190612 <b>New</b>	✓	19.05	6.35	7.93	1.2		
			CNMA190616 <b>New</b>	✓	19.05	6.35	7.93	1.6		

\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items



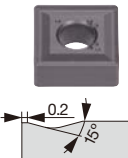
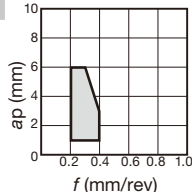

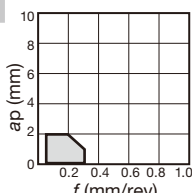
## Rhombic , 55°

Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating				
				T515				
Medium cutting	<b>All-round</b> 		*DNMG150408 ✓	12.7	4.76	5.16	0.8	
			DNMG150412 ✓	12.7	4.76	5.16	1.2	
			DNMG150608 ✓	12.7	6.35	5.16	0.8	
			DNMG150612 ✓	12.7	6.35	5.16	1.2	
Medium cutting	<b>CM</b> 		*DNMG150408-CM ✓	12.7	4.76	5.16	0.8	
			DNMG150412-CM ✓	12.7	4.76	5.16	1.2	
Medium to Heavy cutting	<b>CH</b> 		*DNMG150408-CH ✓	12.7	4.76	5.16	0.8	
			DNMG150412-CH ✓	12.7	4.76	5.16	1.2	
Finishing to medium cutting	<b>- (Flat-top)</b> 		DNMA150404 <b>New</b> ✓	12.7	4.76	5.16	0.4	
			*DNMA150408 ✓	12.7	4.76	5.16	0.8	
			DNMA150604 <b>New</b> ✓	12.7	6.35	5.16	0.4	
			DNMA150608 ✓	12.7	6.35	5.16	0.8	

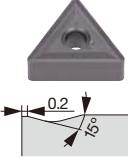
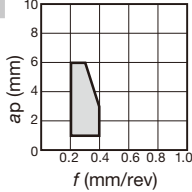
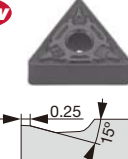
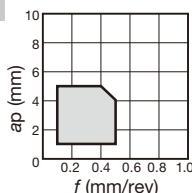
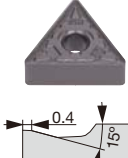
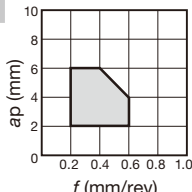
\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## Square , 90°

Application	Chipbreaker		Cat. No	Grade		I.C.dia $\phi d$	Thick-ness $s$	Hole dia $\phi d_1$	Corner radius $r_E$
	Appearance (Cross section)	$f - a_p$		Coating	T515				
				T515	T515				
Medium cutting	<b>All-round</b> 		*SNMG120408	✓	12.7	4.76	5.16	0.8	
			SNMG120412	✓	12.7	4.76	5.16	1.2	
			SNMG150612 <b>New</b>	✓	15.875	6.35	6.35	1.2	
			SNMG150616 <b>New</b>	✓	15.875	6.35	6.35	1.6	
			SNMG190612 <b>New</b>	✓	19.05	6.35	7.93	1.2	
			SNMG190616 <b>New</b>	✓	19.05	6.35	7.93	1.6	
Finishing to medium cutting	<b>- (Flat-top)</b> 		*SNMA120408	✓	12.7	4.76	5.16	0.8	
			SNMA120412	✓	12.7	6.35	5.16	1.2	


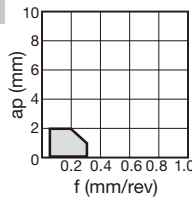
## Triangular , 60°

Application	Chipbreaker		Cat. No	Grade		I.C.dia $\phi d$	Thick-ness $s$	Hole dia $\phi d_1$	Corner radius $r_E$
	Appearance (Cross section)	$f - a_p$		Coating	T515				
				T515	T515				
Medium cutting	<b>All-round</b> 		TNMG160404	✓	9.525	4.76	3.81	0.4	
			*TNMG160408	✓	9.525	4.76	3.81	0.8	
			TNMG160412	✓	9.525	4.76	3.81	1.2	
<b>New</b>	<b>CM</b> 		TNMG160404-CM	✓	9.525	4.76	3.81	0.4	
			*TNMG160408-CM	✓	9.525	4.76	3.81	0.8	
			TNMG160412-CM	✓	9.525	4.76	3.81	1.2	
Finishing to medium cutting	<b>CH</b> 		TNMG160404-CH	✓	9.525	4.76	3.81	0.4	
			*TNMG160408-CH	✓	9.525	4.76	3.81	0.8	
			TNMG160412-CH	✓	9.525	4.76	3.81	1.2	


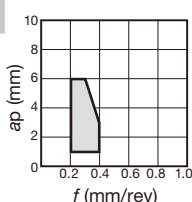
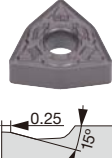
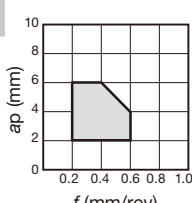

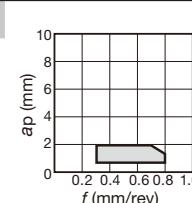

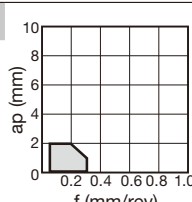
\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## Triangular , 60°

Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating				
				T515				
Finishing to medium cutting			TNMA160404	✓	9.525	4.76	3.81	0.4
			*TNMA160408	✓	9.525	4.76	3.81	0.8
			TNMA160412	✓	9.525	4.76	3.81	1.2

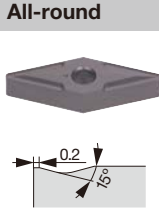
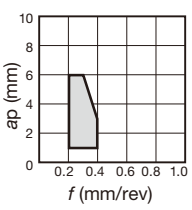
## Trigon , 80°

Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating				
				T515				
Medium cutting			WNMG080404 <b>New</b>	✓	12.7	4.76	5.16	0.4
			*WNMG080408	✓	12.7	4.76	5.16	0.8
			WNMG080412	✓	12.7	4.76	5.16	1.2
			WNMG080416	✓	12.7	4.76	5.16	1.6
					*WNMG080408-CM	✓	12.7	4.76
WNMG080412-CM	✓	12.7			4.76	5.16	1.2	
Finishing to medium cutting			*WNMG080408-SW	✓	12.7	4.76	5.16	0.8
			WNMG080412-SW	✓	12.7	4.76	5.16	1.2
Finishing to medium cutting			*WNMA080408	✓	12.7	4.76	5.16	0.8
			WNMA080412	✓	12.7	4.76	5.16	1.2
			WNMA080416 <b>New</b>	✓	12.7	4.76	5.16	1.6

\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## Rhombic , 35°

Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating				
				T515				
Medium cutting			VNMG160404	✓	9.525	4.76	3.81	0.4
			*VNMG160408	✓	9.525	4.76	3.81	0.8
			VNMG160412 <b>New</b>	✓	9.525	4.76	3.81	1.6

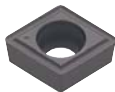
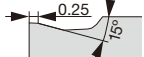
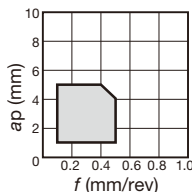




\*Note: Chipbreaker cross sections are of the inserts marked \*



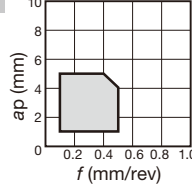


✓ : Stocked items

## INSERTS - POSITIVE TYPE

### Rhombic , 80°

Application	Chipbreaker		$f - a_p$	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	Coating							
		T515							
 		CM	CCMT060204-CM	✓	6.35	2.38	2.8	0.4	
		CCMT060208-CM	✓	6.35	2.38	2.8	0.8		
		CCMT09T304-CM	✓	9.525	3.97	4.4	0.4		
		*CCMT09T308-CM	✓	9.525	3.97	4.4	0.8		
Finishing to medium cutting	 	CM	*CPMT09T304-CM	✓	9.525	3.97	4.4	0.4	
		CPMT09T308-CM	✓	9.525	3.97	4.4	0.8		

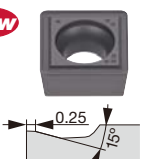
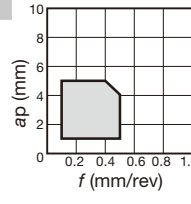
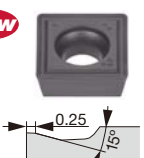
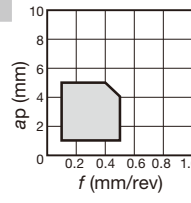
### Rhombic , 55°

Application	Chipbreaker		$f - a_p$	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	Coating							
		T515							
 		CM	DCMT11T304-CM	✓	9.525	3.97	4.4	0.4	
		*DCMT11T308-CM	✓	9.525	3.97	4.4	0.8		
Finishing to medium cutting	 								


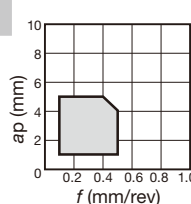

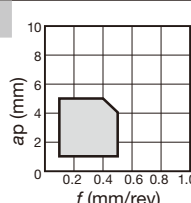
\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## Square , 90°

Application	Chipbreaker		Cat. No	Grade		I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating	T515				
				$\phi d$	s				
Finishing to medium cutting			SCMT09T304-CM	✓	9.525	3.97	4.4	0.4	
			*SCMT09T308-CM	✓	9.525	3.97	4.4	0.8	
			SCMT120404-CM	✓	12.7	4.76	5.5	0.4	
			SCMT120408-CM	✓	12.7	4.76	5.5	0.8	
Finishing to medium cutting			SPMT120404-CM	✓	12.7	4.76	5.5	0.4	
			*SPMT120408-CM	✓	12.7	4.76	5.5	0.8	

## Triangular , 60°

Application	Chipbreaker		Cat. No	Grade		I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating	T515				
				$\phi d$	s				
Finishing to medium cutting			TCMT16T304-CM	✓	9.525	3.97	4.4	0.4	
			*TCMT16T308-CM	✓	9.525	3.97	4.4	0.8	
			TCMT16T312-CM	✓	9.525	3.97	4.4	1.2	
Finishing to medium cutting			TPMT16T304-CM	✓	9.525	3.97	4.4	0.4	
			*TPMT16T308-CM	✓	9.525	3.97	4.4	0.8	
			TPMT16T312-CM	✓	9.525	3.97	4.4	1.2	

\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## Rhombic , 35°


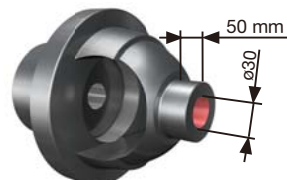
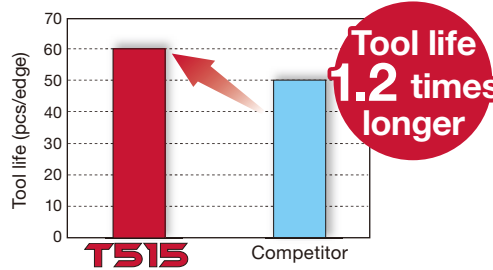
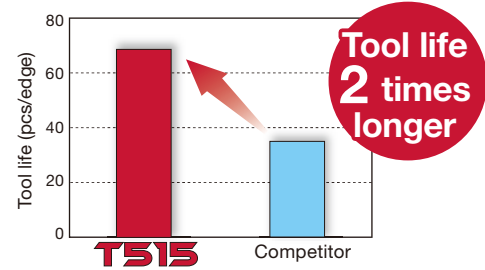
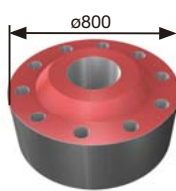
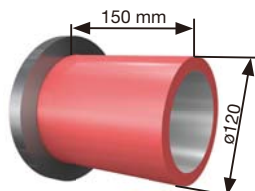
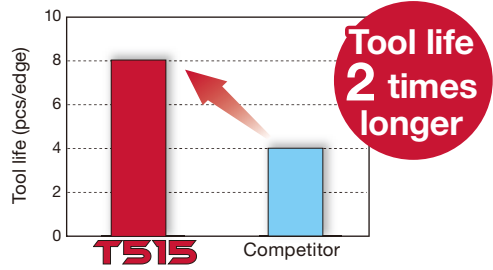
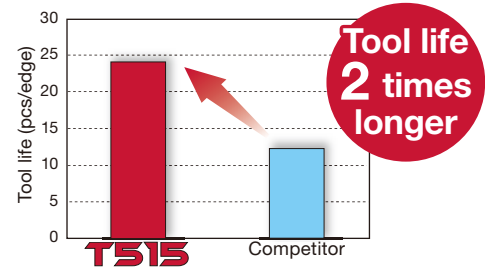
Application	Chipbreaker		Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)	$f - a_p$		Coating				
				T515				
Finishing to medium cutting	<b>CM</b>		VBMT160404-CM	✓	9.525	4.76	4.4	0.4
	<b>New</b>		*VBMT160408-CM	✓	9.525	4.76	4.4	0.8
			VBMT160412-CM	✓	9.525	4.76	4.4	1.2
Finishing to medium cutting	<b>CM</b>		VCMT160404-CM	✓	9.525	4.76	4.4	0.4
	<b>New</b>		*VCMT160408-CM	✓	9.525	4.76	4.4	0.8



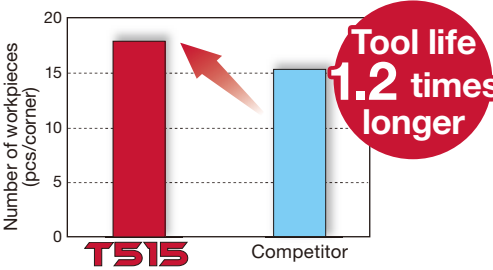
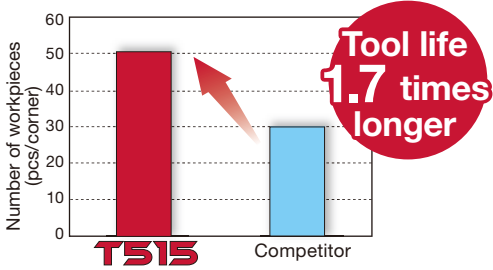
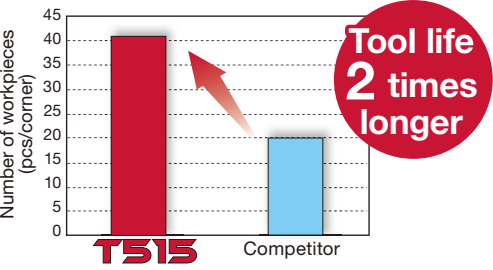
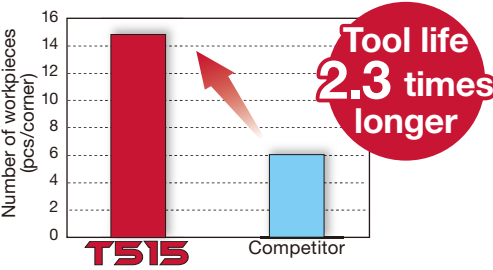
\*Note: Chipbreaker cross sections are of the inserts marked \*

✓ : Stocked items

## PRACTICAL EXAMPLES

Workpiece type		Water pump parts	Differential case
Insert		VBMT160408-CM	TCMT16T308-CM
Grade		T515	T515
Workpiece material		FC  <b>K</b>	FC  <b>K</b>
Cutting conditions	Cutting speed: $V_c$ (m/min)	210	190
	Feed : $f$ (mm/rev)	0.1	0.30
	Depth of cut : $a_p$ (mm)	4.0	2.0
	Machining	External & V-groove machining	Internal machining
	Coolant	Wet	Wet
Results		 <p><b>T515</b> Competitor</p> <p>Tool life (pcs/edge)</p> <p>T515's excellent wear resistance helps increase productivity with the ability to withstand higher cutting speed and extends tool life by 1.2 times.</p>	 <p><b>T515</b> Competitor</p> <p>Tool life (pcs/edge)</p> <p>T515 provides remarkable wear resistance, which doubles tool life compared to the competitor.</p>
Workpiece type		Machine	Machine
Insert		CNMG160612	CNMG120412
Grade		T515	T515
Workpiece material		Grey cast iron  <b>K</b>	FCD  <b>K</b>
Cutting conditions	Cutting speed: $V_c$ (m/min)	180	100
	Feed : $f$ (mm/rev)	0.40	0.40
	Depth of cut : $a_p$ (mm)	4.0mm x 3passes	1.75
	Machining	Facing	External and face turning
	Coolant	Wet	Wet
Results		 <p><b>T515</b> Competitor</p> <p>Tool life (pcs/edge)</p> <p>T515 with excellent fracture resistance delivers stable machining and double tool life.</p>	 <p><b>T515</b> Competitor</p> <p>Tool life (pcs/edge)</p> <p>T515 extends tool life by 2 times compared to the competitor due to outstanding wear resistance.</p>

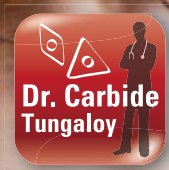
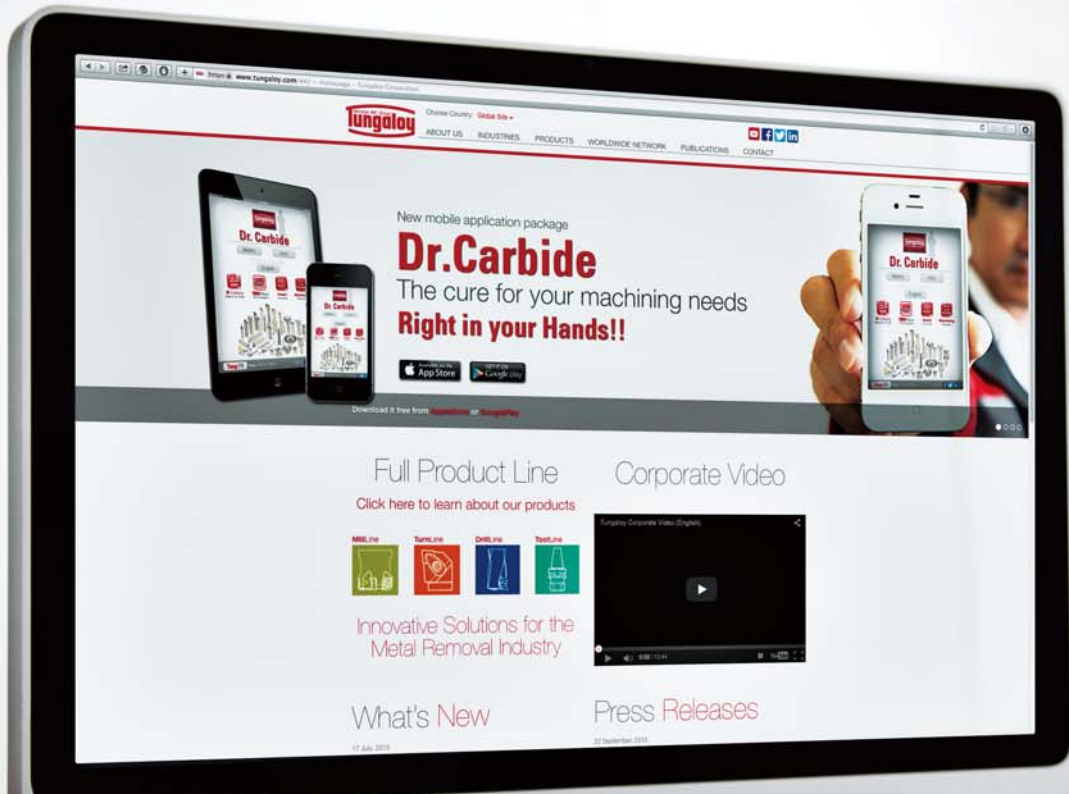


Workpiece type		Hub	Differential case
Insert		CNMG120408	CNMG120412
Grade		T515	T515
Workpiece material		FCD400 / GGG40	Ductile cast iron
Cutting conditions			
Cutting speed: $V_c$ (m/min)		260	140
Feed : $f$ (mm/rev)		0.25	0.25
Depth of cut : $a_p$ (mm)		3.0	1.0
Machining		Face turning	External turning
Coolant		Wet	Wet
Results		 <p><b>T515</b> Competitor</p> <p>Well-balanced wear and chipping resistance extends tool life by 1.2 times in interrupted machining of ductile cast iron.</p>	 <p><b>T515</b> Competitor</p> <p>T515 grade with remarkable wear resistance provides tool life that is 1.7 times longer than the competitor.</p>
Workpiece type		Cam shaft	Automotive part
Insert		TNMG160412	SNMG120412
Grade		T515	T515
Workpiece material		Grey cast iron	Grey cast iron
Cutting conditions			
Cutting speed: $V_c$ (m/min)		140	520
Feed : $f$ (mm/rev)		0.35	0.40
Depth of cut : $a_p$ (mm)		2.0	1.0 - 1.5
Machining		External turning	External and face turning
Coolant		Wet	Wet
Results		 <p><b>T515</b> Competitor</p> <p>Improved wear resistance with thick <math>Al_2O_3</math> layer prolongs tool life by 200%.</p>	 <p><b>T515</b> Competitor</p> <p>T515 grade demonstrates incredible wear resistance even in high-speed cutting, resulting in 230% longer tool life than the competitor.</p>

# MEMO

A large grid of graph paper for taking notes, consisting of 20 columns and 30 rows of small squares.

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