

TurnLine

T515

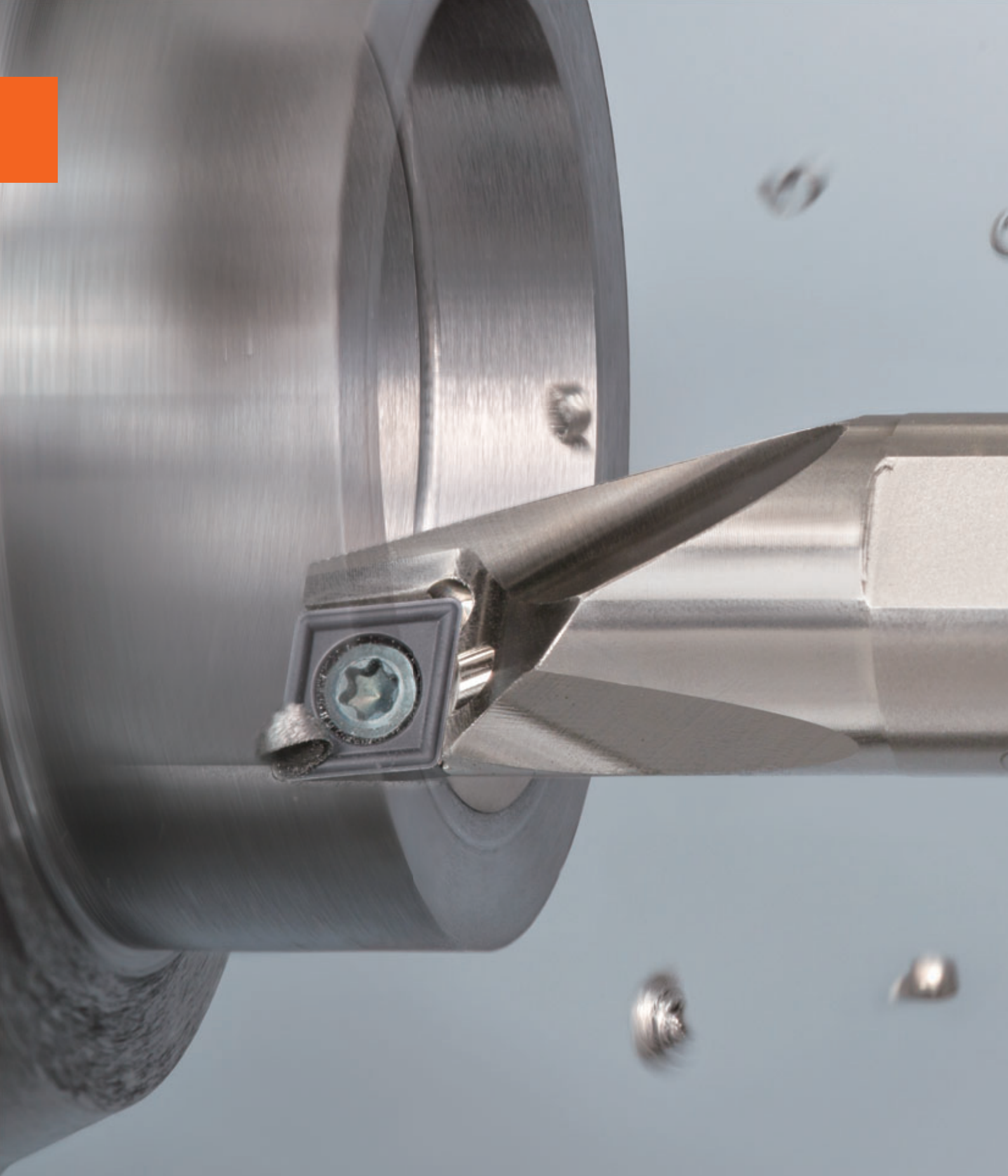
www.tungaloy.com

Tungaloy Report No. 433-G

T515

Versatility at work in cast iron turning





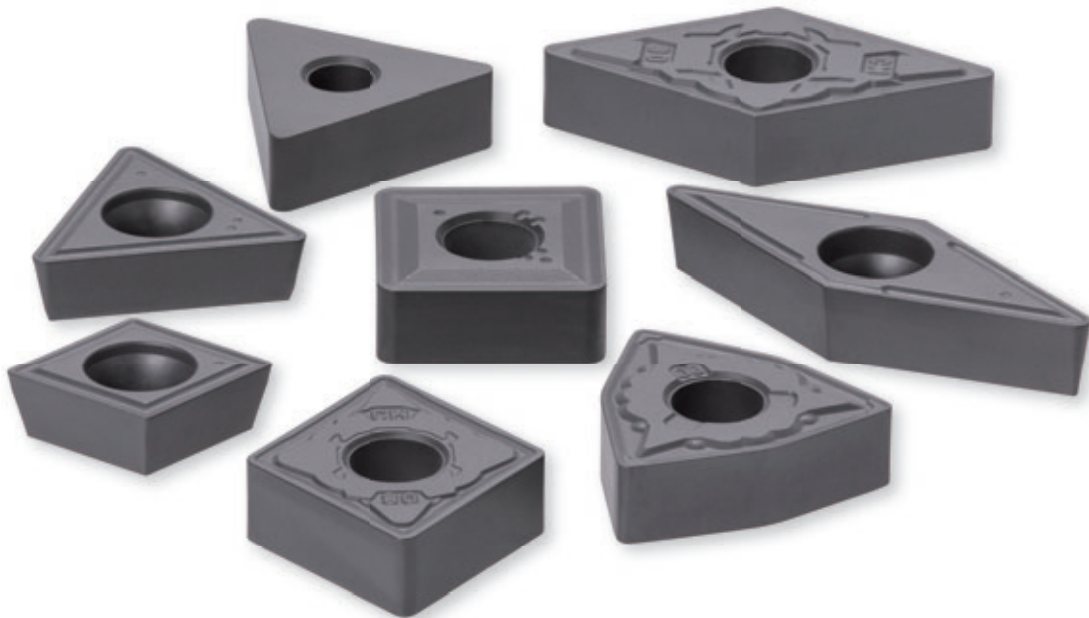
ACCELERATED MACHINING



TurnLine

T515

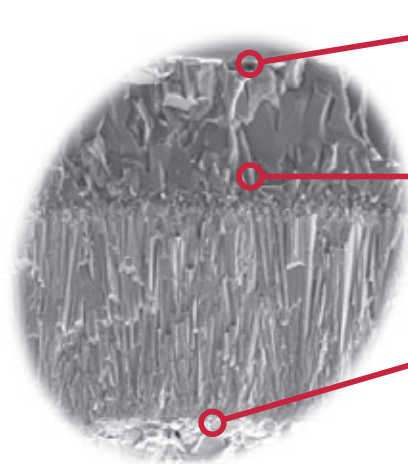
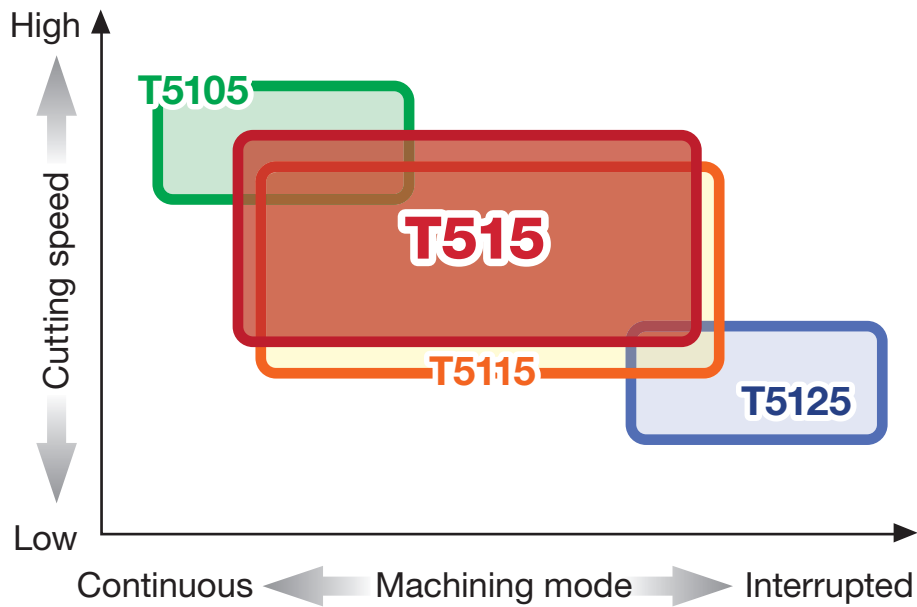
TUNGALOY



Cast iron turning made **easy with an enhanced insert line-up** for higher performance and economy.

www.tungaloy.com

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



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

Excellent wear resistance in high-speed cutting!
Al₂O₃ layer is 1.7 times thicker than the conventional coating.

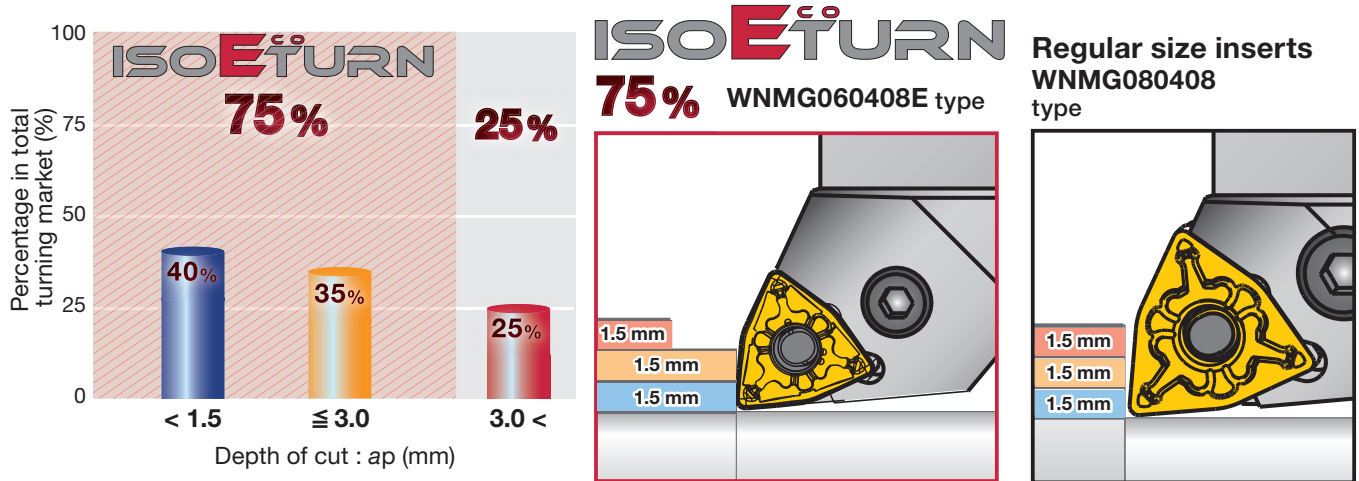
Incredible chipping and fracture resistance!
Strong adhesion between coating and substrate delivers remarkable toughness.

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

New ISO-EcoTurn Small size inserts, for an economical advantage

Over 75%* of the turning market only uses a depth of cut at or less than 3 mm

* Based on Tungaloy market research.

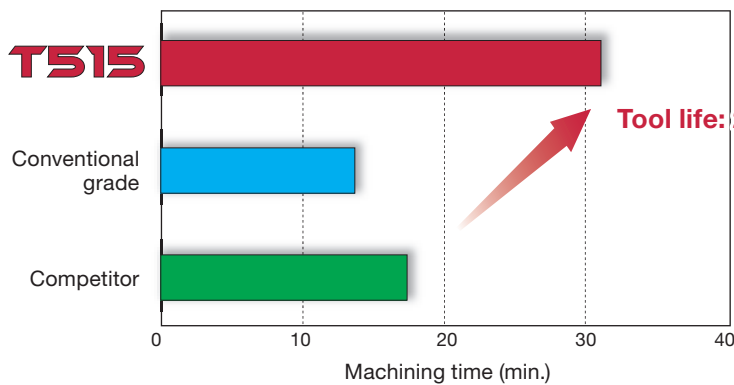


CUTTING PERFORMANCE

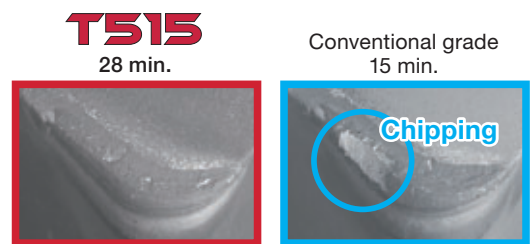
T515 achieves stable, long tool life in both continuous and interrupted machining!

K Grey cast iron (FC200 / GG20)

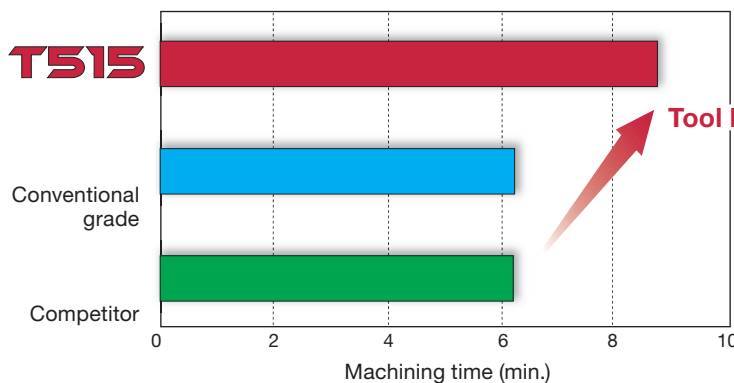
Excellent wear resistance in continuous cutting at high speed!



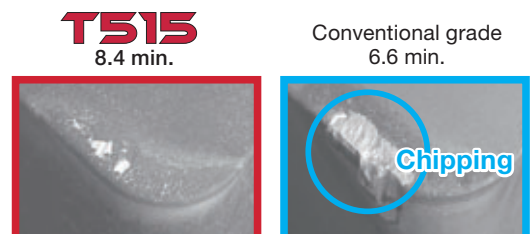
Insert : CNMA120408
 Cutting speed : $V_c = 700$ m/min
 Feed : $f = 0.3$ mm/rev
 Machining : Continuous cutting
 Coolant : Wet



Incredible chipping resistance in interrupted cutting!

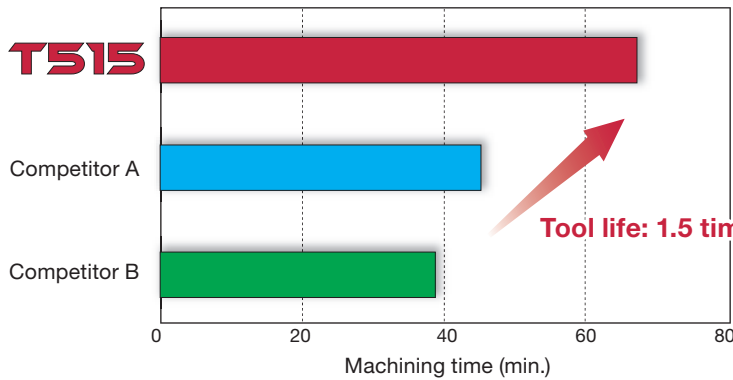


Insert : CNMA120408
 Cutting speed : $V_c = 400$ m/min
 Feed : $f = 0.35$ mm/rev
 Machining : Interrupted cutting
 Coolant : Wet



FC200 Continuous internal machining

K Grey cast iron
(FC200 / GG20)

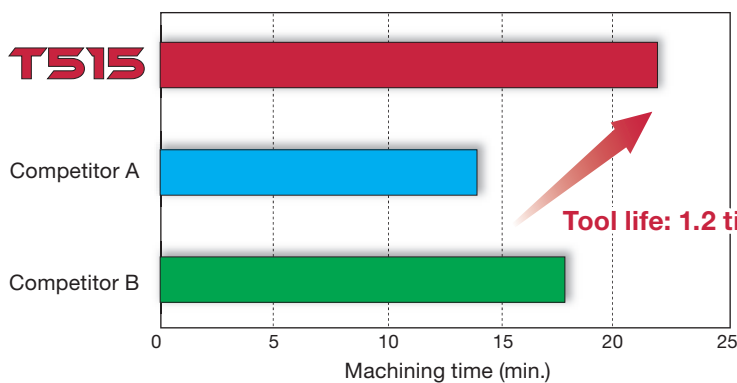


Insert : CCMT09T308-
Cutting speed : $V_c = 300$ m/min
Feed : $f = 0.2$ mm/rev
Depth of cut : $a_p = 1.5$ mm
Machining : Continuous Internal cutting
Coolant : Wet

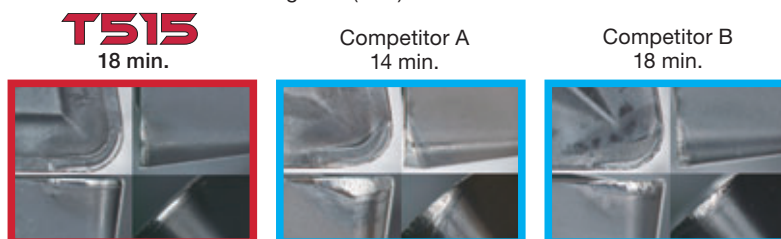


FCD600 Continuous internal machining

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

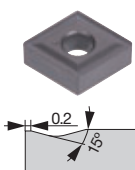
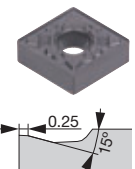
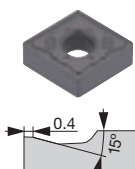
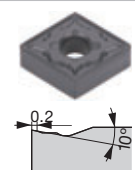
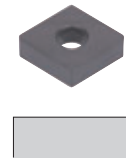
Chipbreaker	Grades	Corner radius r_{ϵ}	Depth of cut a_p (mm)	Feed f (mm/rev)	Cutting speed: V_c (m/min)	
					Grey cast iron	Ductile cast iron
CM	T515	0.8	1.0 - 5.0	0.15 - 0.40	150 - 700	150 - 300
	T515	1.2	1.0 - 5.0	0.15 - 0.50	150 - 700	150 - 300
CH	T515	0.4	2.0 - 6.0	0.10 - 0.30	150 - 700	150 - 300
	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
SW (Wiper)	T515	0.8	0.5 - 2.0	0.30 - 0.60	150 - 700	150 - 300
	T515	1.2	0.5 - 2.0	0.50 - 0.80	150 - 700	150 - 300

For positive insert

Chipbreaker	Grades	Corner radius r_{ϵ}	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

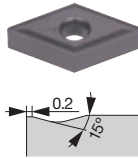
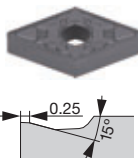
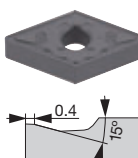

Rhombic, 80° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius	
	Appearance (Cross section)		Coating					
			T515					
				ϕd	s	$\phi d1$	r ϵ	
Medium cutting	All-round	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	●	12.7	4.76	5.16	1.6	
		CNMG160612	●	15.875	6.35	6.35	1.2	
		CNMG160616	●	15.875	6.35	6.35	1.6	
		CNMG190612	●	19.05	6.35	7.93	1.2	
		CNMG190616	●	19.05	6.35	7.93	1.6	
	CM	CNMG120404-CM New	●	12.7	4.76	5.16	0.4	
		CNMG120408-CM	●	12.7	4.76	5.16	0.8	
		*CNMG120412-CM	●	12.7	4.76	5.16	1.2	
		CNMG160612-CM New	●	15.875	6.35	6.35	1.2	
	Medium to Heavy cutting	CH	*CNMG120408-CH	●	12.7	4.76	5.16	0.8
			CNMG120412-CH	●	12.7	4.76	5.16	1.2
Finishing to medium cutting	SW(Wiper)	*CNMG120408-SW	●	12.7	4.76	5.16	0.8	
		CNMG120412-SW	●	12.7	4.76	5.16	1.2	
		- (Flat-top)	CNMA090404E New	●	9.525	4.76	3.81	0.4
		CNMA090408E New	●	9.525	4.76	3.81	0.8	
		CNMA090412E New	●	9.525	4.76	3.81	1.2	
		CNMA090416E New	●	9.525	4.76	3.81	1.6	
		*CNMA120408	●	12.7	4.76	5.16	0.8	
		CNMA120412	●	12.7	4.76	5.16	1.2	
		CNMA160612	●	15.875	6.35	6.35	1.2	
		CNMA160616	●	15.875	6.35	6.35	1.6	
		CNMA190612	●	19.05	6.35	7.93	1.2	
		CNMA190616	●	19.05	6.35	7.93	1.6	

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

● : Line up

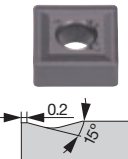
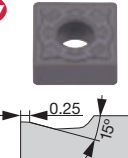

Rhombic, 55° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia $\varnothing d$	Thick-ness s	Hole dia $\varnothing d1$	Corner radius r_E
	Appearance (Cross section)		Coating				
			T515				
Medium cutting	All-round	*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
	CM	DNMG150404-CM New	●	12.7	4.76	5.16	0.4
		*DNMG150408-CM	●	12.7	4.76	5.16	0.8
		DNMG150412-CM	●	12.7	4.76	5.16	1.2
Medium to Heavy cutting	CH	*DNMG150408-CH	●	12.7	4.76	5.16	0.8
		DNMG150412-CH	●	12.7	4.76	5.16	1.2
Finishing to medium cutting		- (Flat-top)	DNMA110404E New	●	9.525	4.76	3.81
		DNMA110408E New	●	9.525	4.76	3.81	0.8
		DNMA110412E New	●	9.525	4.76	3.81	1.2
		DNMA150404	●	12.7	4.76	5.16	0.4
		*DNMA150408	●	12.7	4.76	5.16	0.8
		DNMA150604	●	12.7	6.35	5.16	0.4
		DNMA150608	●	12.7	6.35	5.16	0.8

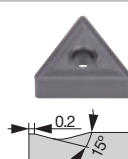
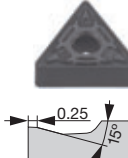
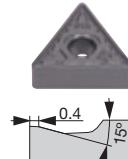
*Note: Chipbreaker cross sections are of the inserts marked *

● : Line up

Square, 90° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia ϕd	Thick-ness s	Hole dia $\phi d1$	Corner radius r_E
	Appearance (Cross section)		Coating				
			T515				
Medium cutting	All-round	*SNMG120408	●	12.7	4.76	5.16	0.8
		SNMG120412	●	12.7	4.76	5.16	1.2
		SNMG150612	●	15.875	6.35	6.35	1.2
		SNMG150616	●	15.875	6.35	6.35	1.6
		SNMG190612	●	19.05	6.35	7.93	1.2
		SNMG190616	●	19.05	6.35	7.93	1.6
		CM	SNMG120408-CM	●	12.7	4.76	5.16
		SNMG120412-CM	●	12.7	4.76	5.16	1.2
Finishing to medium cutting	- (Flat-top)	*SNMA120408	●	12.7	4.76	5.16	0.8
		SNMA120412	●	12.7	4.76	5.16	1.2


Triangular, 60° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia ϕd	Thick-ness s	Hole dia $\phi d1$	Corner radius r_E
	Appearance (Cross section)		Coating				
			T515				
Medium cutting	All-round	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
		CM	TNMG160404-CM	●	9.525	4.76	3.81
		*TNMG160408-CM	●	9.525	4.76	3.81	0.8
		TNMG160412-CM	●	9.525	4.76	3.81	1.2
Finishing to medium cutting	CH	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

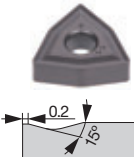
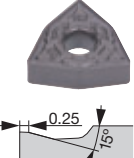


*Note: Chipbreaker cross sections are of the inserts marked *

● : Line up

Triangular, 60° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia $\varnothing d$	Thick-ness s	Hole dia $\varnothing d_1$	Corner radius r_E
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	- (Flat-top)	TNMA110404E New	●	6.35	4.76	2.26	0.4
		TNMA110408E New	●	6.35	4.76	2.26	0.8
		TNMA110412E New	●	6.35	4.76	2.26	1.2
		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


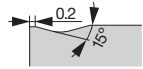

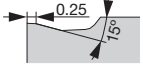


Trigon, 80° with hole

Application	Chipbreaker	Cat. No	Grade	I.C.dia $\varnothing d$	Thick-ness s	Hole dia $\varnothing d_1$	Corner radius r_E	
	Appearance (Cross section)		Coating					
			T515					
Medium cutting	All-round	WNMG080404	●	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	
		CM	*WNMG080408-CM	●	12.7	4.76	5.16	0.8
		WNMG080412-CM	●	12.7	4.76	5.16	1.2	
Finishing to medium cutting	SW	*WNMG080408-SW	●	12.7	4.76	5.16	0.8	
		WNMG080412-SW	●	12.7	4.76	5.16	1.2	
		- (Flat-top)	WNMA060404E New	●	9.525	4.76	3.81	0.4
			WNMA060408E New	●	9.525	4.76	3.81	0.8
			WNMA060412E New	●	9.525	4.76	3.81	1.2
			WNMA060416E New	●	9.525	4.76	3.81	1.6
			*WNMA080408	●	12.7	4.76	5.16	0.8
			WNMA080412	●	12.7	4.76	5.16	1.2
			WNMA080416	●	12.7	4.76	5.16	1.6

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

● : Line up

Rhombic, 35° with hole

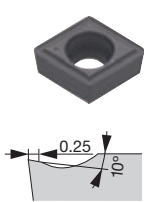
Application	Chipbreaker	Cat. No	Grade	I.C.dia ϕd	Thick-ness s	Hole dia $\phi d1$	Corner radius r_E
	Appearance (Cross section)		Coating				
			T515				
Medium cutting	All-round	VNMG160404	●	9.525	4.76	3.81	0.4
		*VNMG160408	●	9.525	4.76	3.81	0.8
		VNMG160412	●	9.525	4.76	3.81	1.2
							
New 	CM	VNMG160408-CM	●	9.525	4.76	3.81	0.8
							
New Finishing to medium cutting 	- (Flat-top)	VNMA120404E	●	7.15	4.76	3.81	0.4
		VNMA120408E	●	7.15	4.76	3.81	0.8
							

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

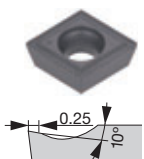
● : Line up

INSERTS - POSITIVE TYPE

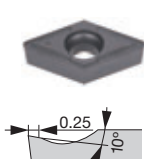
Rhombic, 80° with hole Positive 7°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	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

Rhombic, 80° with hole Positive 11°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	CPMT090304-CM	●	9.525	3.18	4.4	0.4
		CPMT090308-CM	●	9.525	3.18	4.4	0.8
		*CPMT09T304-CM	●	9.525	3.97	4.4	0.4
		CPMT09T308-CM	●	9.525	3.97	4.4	0.8

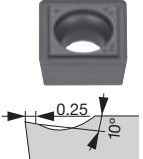
Rhombic, 55° with hole Positive 7°

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

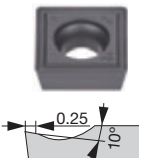
*Note: Chipbreaker cross sections are of the inserts marked *

● : Line up

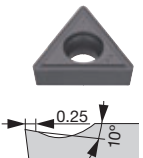
Square, 90° with hole Positive 7°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	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

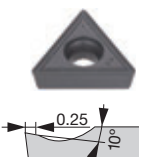
Square, 90° with hole Positive 11°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	SPMT120404-CM	●	12.7	4.76	5.5	0.4
		*SPMT120408-CM	●	12.7	4.76	5.5	0.8

Triangular, 60° with hole Positive 7°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	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

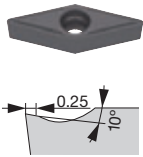
Triangular, 60° with hole Positive 11°

Application	Chipbreaker	Cat. No	Grade	I.C.dia	Thick-ness	Hole dia	Corner radius
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	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

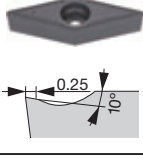
*Note: Chipbreaker cross sections are of the inserts marked *

● : Line up

Rhombic, 35° with hole Positive 5°

Application	Chipbreaker	Cat. No	Grade	I.C.dia $\varnothing d$	Thick-ness s	Hole dia $\varnothing d1$	Corner radius r_{ϵ}
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	VBMT160404-CM	●	9.525	4.76	4.4	0.4
		*VBMT160408-CM	●	9.525	4.76	4.4	0.8
		VBMT160412-CM	●	9.525	4.76	4.4	1.2

Rhombic, 35° with hole Positive 7°

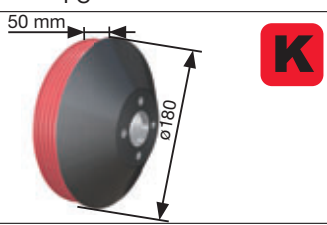
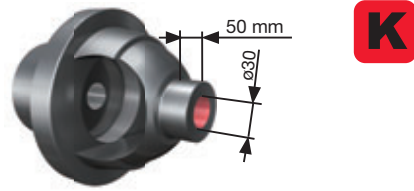
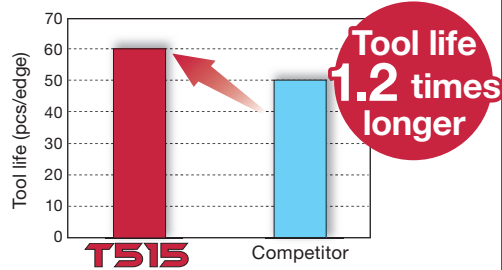
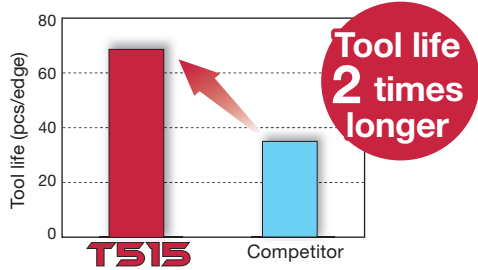
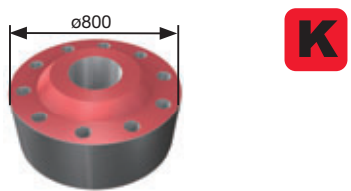
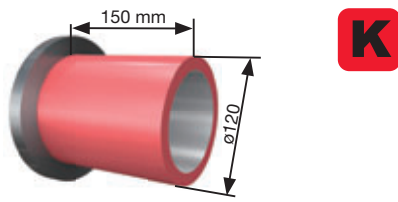
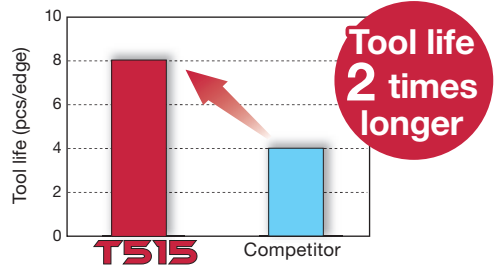
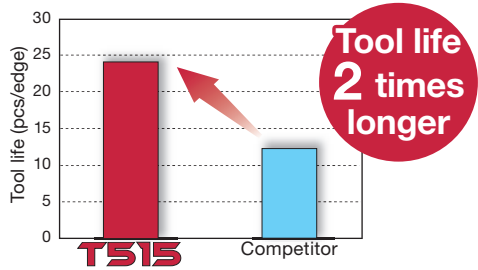
Application	Chipbreaker	Cat. No	Grade	I.C.dia $\varnothing d$	Thick-ness s	Hole dia $\varnothing d1$	Corner radius r_{ϵ}
	Appearance (Cross section)		Coating				
			T515				
Finishing to medium cutting	CM	VCMT160404-CM	●	9.525	4.76	4.4	0.4
		*VCMT160408-CM	●	9.525	4.76	4.4	0.8

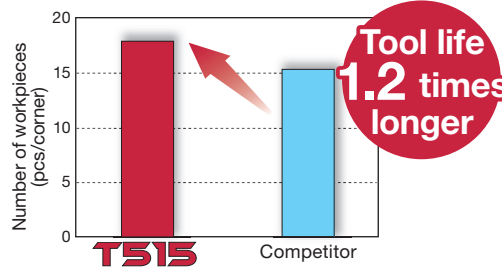
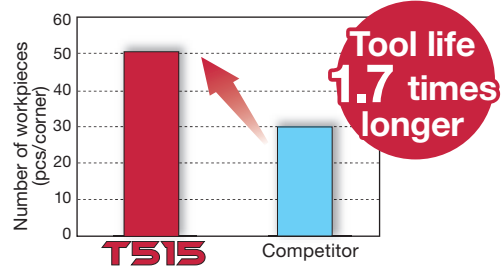
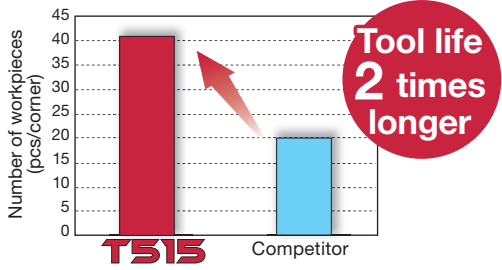
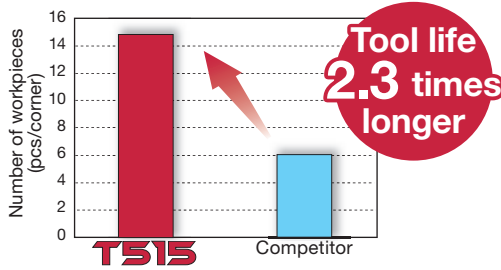


*Note: Chipbreaker cross sections are of the inserts marked *

● : Line up

PRACTICAL EXAMPLES

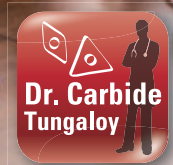
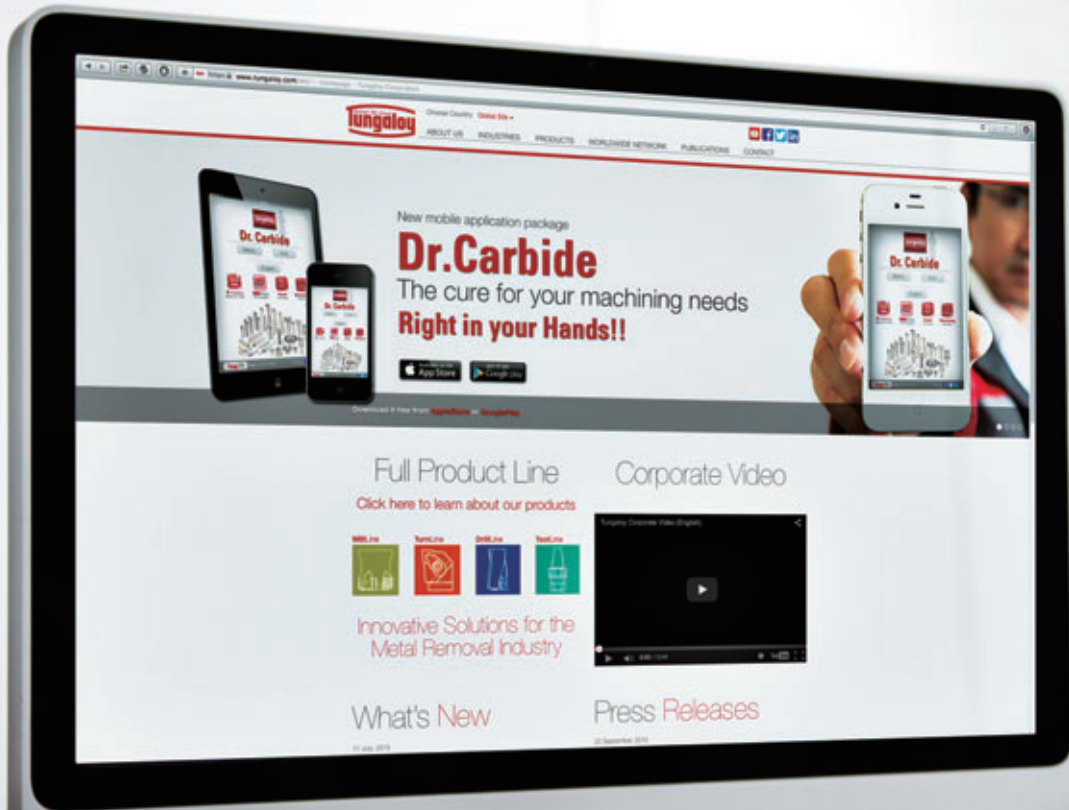
Workpiece type		Water pump parts	Differential case
Insert		VBMT160408-CM	TCMT16T308-CM
Grade		T515	T515
Workpiece material		FC	FC
Workpiece material			
Cutting conditions	Cutting speed: V_c (m/min)	210	190
	Feed : f (mm/rev)	0.1	0.30
	Depth of cut : a_p (mm)	4.0	2.0
	Machining	External & V-groove machining	Internal machining
	Coolant	Wet	Wet
Results		 <p>T515 Competitor</p> <p>Tool life (pcs/edge)</p> <p>Tool life 1.2 times longer</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>T515 Competitor</p> <p>Tool life (pcs/edge)</p> <p>Tool life 2 times longer</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	FCD
Workpiece material			
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>T515 Competitor</p> <p>Tool life (pcs/edge)</p> <p>Tool life 2 times longer</p> <p>T515 with excellent fracture resistance delivers stable machining and double tool life.</p>	 <p>T515 Competitor</p> <p>Tool life (pcs/edge)</p> <p>Tool life 2 times longer</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>Tool life 1.2 times longer</p> <p>Well-balanced wear and chipping resistance extends tool life by 1.2 times in interrupted machining of ductile cast iron.</p>	 <p>Tool life 1.7 times longer</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>Tool life 2 times longer</p> <p>Improved wear resistance with thick Al_2O_3 layer prolongs tool life by 200%.</p>	 <p>Tool life 2.3 times longer</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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