

Tungaloy

Member IMC Group

Keeping the Customer First

Tungaloy Report No. 372-G

MILLLINE Face milling cutter

DOPENT

TEN / EEN type

**New grades
extended version**

Highly productive and economical face milling cutter !



Highly rigid cutter that offers excellent productivity levels !!



Features

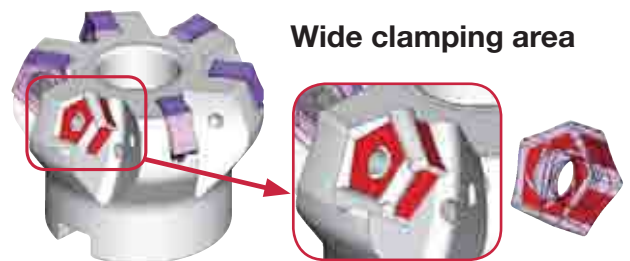
● Double sided pentagonal insert

- Remarkable performance levels!
- Insert inclination reduces the cutting forces



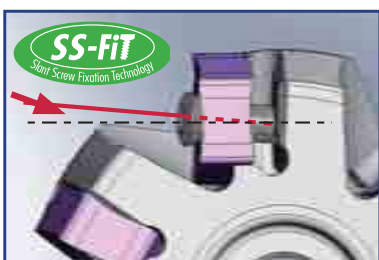
● Extremely rigid cutting tool

- Rigid clamping with large contact area
- High rigidity enables high productivity



● Extra close pitch cutter available

- Increased number of inserts for improved productivity!!
- The extra close pitch **SS-FIT** system improves rigidity and performance



Coarse pitch



Extra close pitch





Variation of inserts

MJ

P Steel **M** Stainless **K** Cast iron

Width of land

Rake angle

• For general machining
Excellent balance of edge sharpness and strength

AJ

N Non-ferrous

Rake angle

• For aluminium machining
Lapped rake face for reduced adhesion

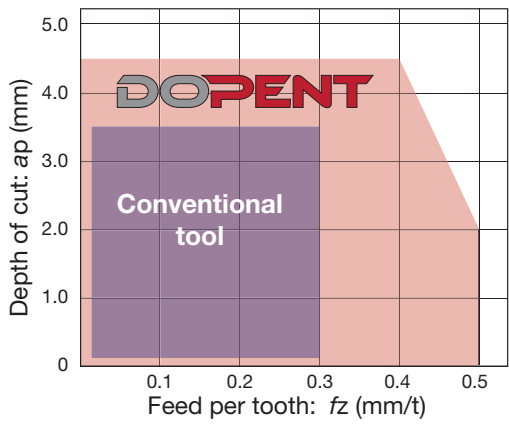
W (Wiper)

P Steel **K** Cast iron

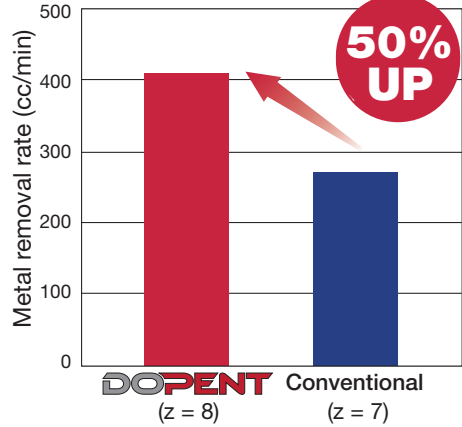
• For finishing
Provides excellent surface finish

Cutting performance

Comparison of application areas

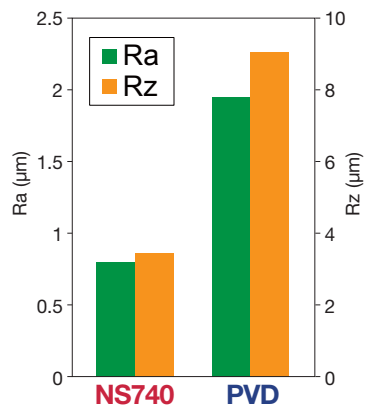
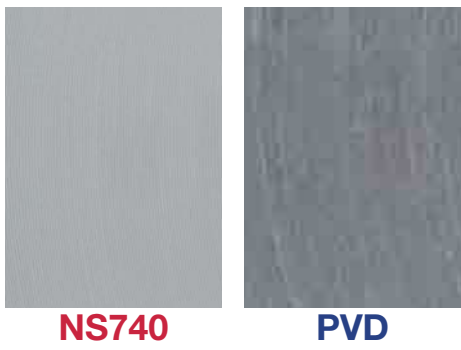


Comparison of metal removal rate



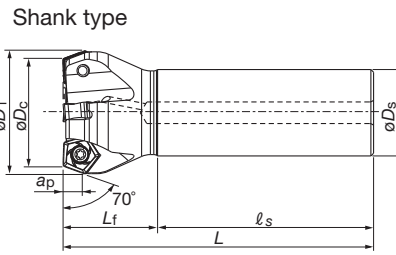
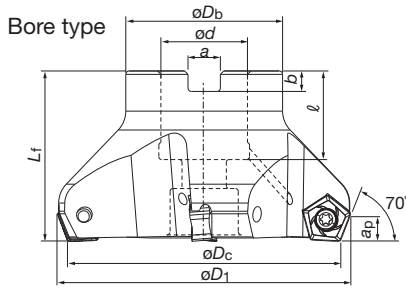
Work material : S55C / C55 (200HB)
 Tool : $\phi Dc = \phi 100$ mm
 Cutting speed : $Vc = 200$ m/min
 Feed per tooth
 DOPENT : $fz = 0.4$ mm/t (z = 8)
 Conventional : $fz = 0.3$ mm/t (z = 7)
 Depth of cut : $ap = 4$ mm
 Width of cut : $ae = 50$ mm
 Conventional tool: Milling cutter with 4-corner insert

Comparison of surface finish



Cutter : TEN09R100M31.7-05 (z = 1)
 Insert : PNCU0905GNER-MJ
 Work material : SS400 / E275A (126HB)
 Cutting speed : $Vc = 250$ m/min
 Feed per tooth : $fz = 0.15$ mm/t
 Depth of cut : $ap = 0.3$ mm
 Width of cut : $ae = 75$ mm
 Process : Face milling
 Coolant : Dry
 Machine : Vertical M/C, BT50, 30 kw

Milling cutter



Max. depth of cut : Max. $a_p = 6.4$ mm



■ Bore type replacement parts (Table 1)

Descriptions		Parts Cat. No.	
Applicable cutter		TEN09R...	*TEN09R...
Clamping screw		CSTR-4L100	
Wrench	Torx bit	BT15S	BT15M
	Grip	H-TBS	
Mono block type substitution wrench		T-15D	

■ Bore type

JIS

Pitch	Cat. No.	Stock	No. of Inserts	Dimensions (mm)								Weight (kg)	Air hole	Center bolt
				ϕD_c	ϕD_1	ϕD_b	ϕd	l	L_f	b	a			
Coarse	TEN09R050M22.0-03	●	3	50	56	41	22	20	40	6	10	0.3	with	CM10x30H
	TEN09R063M22.0-04	●	4	63	69	41	22	20	40	6	10	0.5	with	CM10x30H
	TEN09R080M25.4-04	●	4	80	86	46	25.4	26	50	6	9.5	0.9	with	CM12x30H
	TEN09R100M31.7-05	●	5	100	106	60	31.75	32	50	8	12.7	1.3	with	TMBA-M16H
	*TEN09R125M38.1-06	●	6	125	131	80	38.1	38	63	10	15.9	2.6	with	TMBA-M20H
	*TEN09R160M50.8-07	●	7	160	166	100	50.8	46	63	11	19	4.4	without	-
Close	TEN09R050M22.0-04	●	4	50	56	41	22	20	40	6	10	0.3	with	CM10x30H
	TEN09R063M22.0-06	●	6	63	69	41	22	20	40	6	10	0.5	with	CM10x30H
	TEN09R080M25.4-07	●	7	80	86	46	25.4	26	50	6	9.5	0.9	with	CM12x30H
	TEN09R100M31.7-08	●	8	100	106	60	31.75	32	50	8	12.7	1.3	with	TMBA-M16H
	*TEN09R125M38.1-10	●	10	125	131	80	38.1	38	63	10	15.9	2.7	with	TMBA-M20H
	*TEN09R160M50.8-12	●	12	160	166	100	50.8	46	63	11	19	4.6	without	-
Extra close	TEN09R050M22.0-06	●	6	50	56	41	22	20	40	6	10	0.3	with	CM10x30H
	TEN09R063M22.0-08	●	8	63	69	41	22	20	40	6	10	0.5	with	CM10x30H
	TEN09R080M25.4-10	●	10	80	86	46	25.4	26	50	6	9.5	0.9	with	CM12x30H
	TEN09R100M31.7-12	●	12	100	106	60	31.75	32	50	8	12.7	1.4	with	TMBA-M16H
	TEN09R125M38.1-16	●	16	125	131	80	38.1	38	63	10	15.9	2.9	with	TMBA-M20H
	TEN09R160M50.8-20	●	20	160	166	100	50.8	46	63	11	19	4.9	without	-

* Cat. No. of Torx bit is different from other items. (Please see the above table 1)

ISO

Pitch	Cat. No.	Stock	No. of inserts	Dimensions (mm)								Weight (kg)	Air hole	Center bolt
				ϕD_c	ϕD_1	ϕD_b	ϕd	l	L_f	b	a			
Close	TEN09R050M22.0E04	●	4	50	56	41	22	20	40	6.3	10.4	0.3	with	CM10x30H
	TEN09R063M22.0E06	●	6	63	69	41	22	20	40	6.3	10.4	0.5	with	CM10x30H
	TEN09R080M27.0E07	●	7	80	86	50	27	22	50	7	12.4	0.9	with	CM12x30H
	TEN09R100M32.0E08	●	8	100	106	60	32	28.5	50	8	14.4	1.3	with	TMBA-M16H
	*TEN09R125M40.0E10	●	10	125	131	71	40	32	63	9	16.4	2.3	with	TMBA-M20H
	*TEN09R160M40.0E12	●	12	160	166	100	40	29	63	9	16.4	4.0	without	-
Extra close	TEN09R050M22.0E06	●	6	50	56	41	22	20	40	6.3	10.4	0.3	with	CM10x30H
	TEN09R063M22.0E08	●	8	63	69	41	22	20	40	6.3	10.4	0.5	with	CM10x30H
	TEN09R080M27.0E10	●	10	80	86	50	27	22	50	7	12.4	1.0	with	CM12x30H
	TEN09R100M32.0E12	●	12	100	106	60	32	28.5	50	8	14.4	1.4	with	TMBA-M16H
	TEN09R125M40.0E16	●	16	125	131	71	40	32	63	9	16.4	2.5	with	TMBA-M20H
	TEN09R160M40.0E20	●	20	160	166	100	40	29	63	9	16.4	4.3	without	-

* Cat. No. of Torx bit is different from other items. (Please see the above table 1)

● : Stocked items

■ Shank type JIS / ISO

Cat. No.	Stock	No. of Inserts	Dimensions (mm)						Weight (kg)	Air hole	Parts	
			$\varnothing D_c$	$\varnothing D_1$	$\varnothing D_s$	l_s	L_f	L			Clamping screw	Wrench (Substitution)
EEN09R032M32.0-03	●	3	32	38	32	80	35	115	0.7	with	CSTR-4L100	T-15DB (T-15D)
EEN09R040M32.0-04	●	4	40	46	32	80	35	115	0.7	with		
EEN09R050M32.0-04	●	4	50	56	32	80	40	120	0.9	with		
EEN09R063M32.0-06	●	6	63	69	32	80	40	120	1.0	with		
EEN09R080M32.0-07	●	7	80	86	32	80	40	120	1.3	with		

Inserts

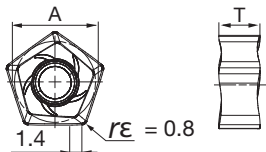


Fig. 1 MJ (General)

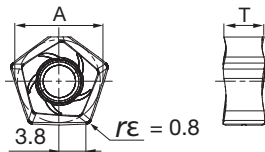


Fig. 2 W (Wiper)

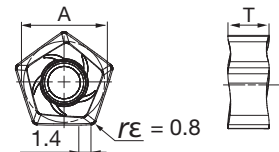


Fig. 3 AJ (For aluminium)

Cat. No.	Accuracy	Honing	Grades						Dimensions (mm)		Shape	
			Coated					Cermet	Carbide	A		T
			AH725	AH120	AH140	NEW T1115	NEW T3130	NEW NS740	TH10			
PNCU0905GNER-MJ	C	with	●	●	●	●	●	●		12.2	5.9	Fig. 1
PNCU0905GNER-W	C	with	●							12.2	5.9	Fig. 2
PNCU0905GNFR-AJ	C	without							●	12.2	6.3	Fig. 3



● : Stocked items

Standard cutting conditions

Work materials	Hardness HB	Selection criteria	Recommended grade	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
Low carbon steels (S15C / C15 etc)	~ 200	First choice	AH725	100 - 250	0.1 - 0.6
		Priority on impact resistance	AH140	80 - 180	
		Priority on wear resistance	T3130	120 - 250	
		Priority on surface quality	NS740	100 - 250	0.1 - 0.5
High carbon steels (S45C / C45 etc)	200 ~ 300	First choice	AH725	100 - 230	0.1 - 0.5
		Priority on impact resistance	AH140	80 - 180	
		Priority on wear resistance	T3130	120 - 250	
		Priority on surface quality	NS740	100 - 250	0.1 - 0.4
Alloyed steels (SCM440 / 42CrMo4 etc)	150 ~ 300	First choice	AH725	100 - 230	0.1 - 0.5
		Priority on impact resistance	AH140	80 - 150	
		Priority on wear resistance	T3130	120 - 250	
		Priority on surface quality	NS740	100 - 250	0.1 - 0.4
Tool steels (SKD11 / X153CrMoV12 etc)	~ 300	First choice	AH725	100 - 180	0.1 - 0.5
		Priority on impact resistance	AH140	80 - 120	
		Priority on wear resistance	T3130	100 - 180	
Stainless steels (SUS304 / X5CrNi18-9 etc)	-	First choice	AH140	90 - 180	0.1 - 0.45
Grey cast irons (FC250 / GG25 / 250 etc)	-	First choice	AH120	140 - 250	0.1 - 0.6
		Priority on wear resistance	T1115	150 - 280	
Ductile cast irons (FCD450 / GGG45 / 450-10S etc)	-	First choice	AH120	100 - 200	0.1 - 0.6
		Priority on wear resistance	T1115	120 - 220	
Aluminium alloys (Si < 13%)	-	First choice	TH10	500 - 1500	0.1 - 0.5
Aluminium alloys (Si ≥ 13%)				150 - 500	

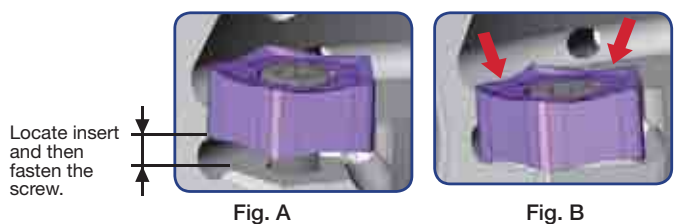
- Remove excessive chip accumulation with an air blast.
- When chips stick to the cutting edges (aluminium machining), use a water soluble coolant.
- When cutting an interrupted surface or a casting skin, the feed (fz)

should be reduced below the recommended value shown in the above table.

- Cutting conditions are limited by machine power, workpiece rigidity, and spindle output. When the cutting width, depth or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

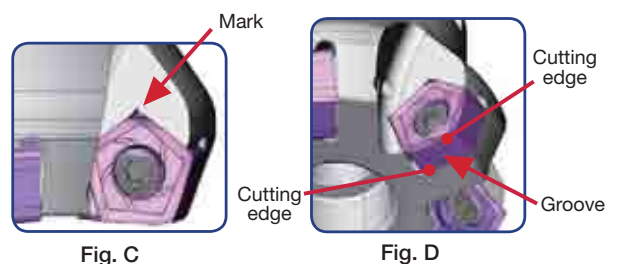
Installation of inserts with extra close pitch cutter

- The extra close pitch cutter has a slanted screw.
- Locate insert and then fasten the screw. (Fig. A)
- After fastening the screw, please ensure there is no gap between the cutter body and insert. (Fig. B)

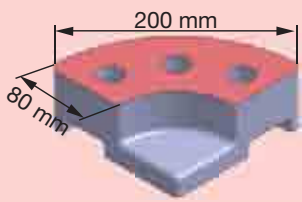
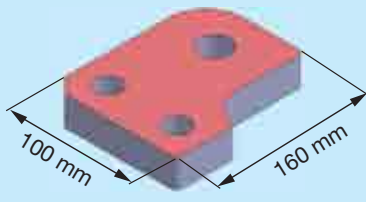
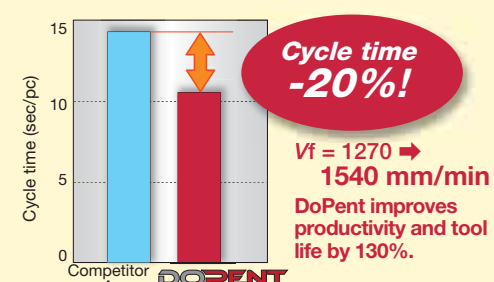
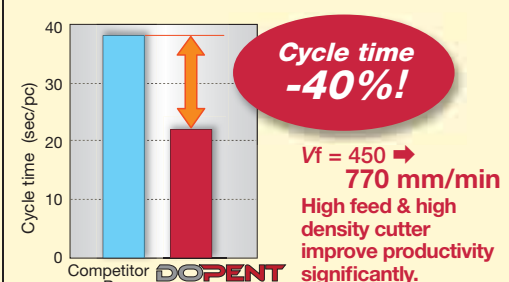


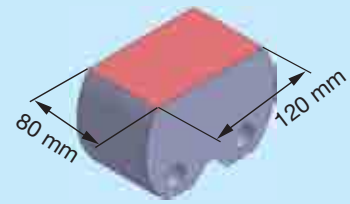
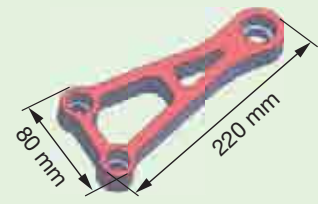
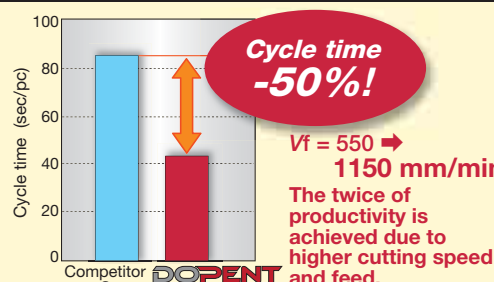
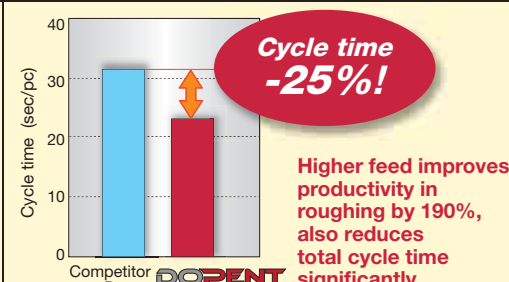
Notes for using wiper inserts

- When a fine surface finish is required, wiper insert PNCU0905GNER-W is recommended.
- When using the wiper insert, install the insert as shown in Fig. C. Also ensure the groove is at the front of the insert as shown in Fig. D.
- The wiper insert has two corners available (Fig. D). Do not use the other corners as this may break the cutter body.



Practical examples

Workpiece type		Machine parts	Fixing plate
Milling cutter		TEN09R100M31.7-08	TEN09R125M38.1-10
Insert		PNCU0905GNER-MJ	PNCU0905GNER-MJ
Grade		AH120	AH725
Work material		FC300 / GG30 / 300 (200HB)	SCM440 / 42CrMo4 (300HB)
			
Cutting conditions	Cutting speed: V_c (m/min)	200	150
	Feed per tooth: f_z (mm/t)	0.3	0.2
	Feed speed: V_f (mm/min)	1540	770
	Depth of cut: a_p (mm)	2.5	Two 4 mm passes
	Width of cut: a_e (mm)	75	80
	Process	Face milling	Face milling
	Coolant	Dry	Dry
Machine	Vertical M/C, BT50	Vertical M/C, BT50	
Results			

Workpiece type		Balancing weight	Motorcycle parts
Milling cutter		TEN09R125M38.1-06	TEN09R125M38.1-10
Insert		PNCU0905GNER-MJ	PNCU0905GNFR-AJ
Grade		AH725	TH10
Work material		S25C / C25 (150HB)	A7075 / AW-7075 / AlZn5.5MgCu (200HB)
			
Cutting conditions	Cutting speed: V_c (m/min)	250	1000
	Feed per tooth: f_z (mm/t)	0.3	Roughing: 0.3, Finishing: 0.1
	Feed speed: V_f (mm/min)	1150	Roughing: 7640, Finishing: 2550
	Depth of cut: a_p (mm)	Eight 4 mm passes	Roughing: 2, Finishing: 0.5
	Width of cut: a_e (mm)	80	20 ~ 80
	Process	Face milling	Face milling
	Coolant	Dry	Wet
Machine	Vertical M/C, BT50	Vertical M/C, BT40	
Results			



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