

High productive and cost-effective shoulder milling cutter
Now available with **07 size insert** for small parts





ACCELERATED MACHINING





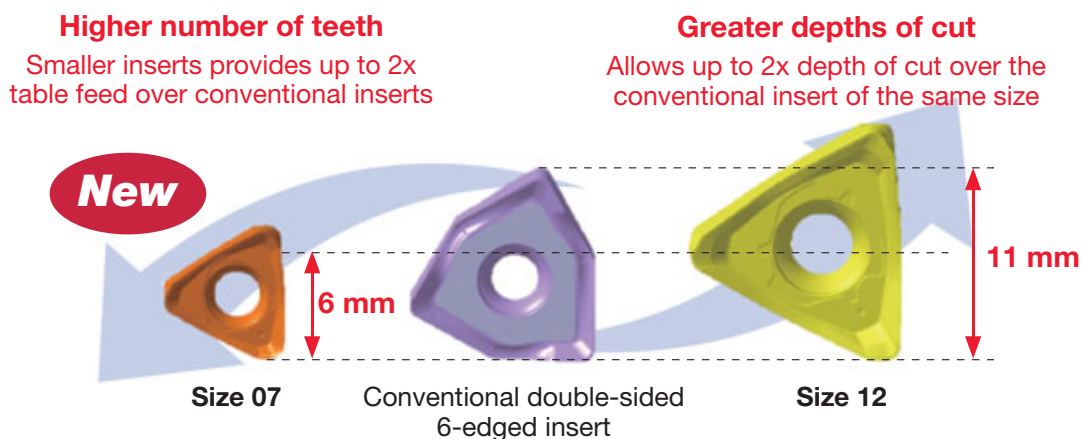
New **07 geometry** for superior surface finishing broadens the application range of **DoForce-Tri** which offers maximum benefits in economy and performance

Economical shoulder mill with an innovative 6-edged geometry for **maximum performance** in various applications

Innovative insert design for improved productivity

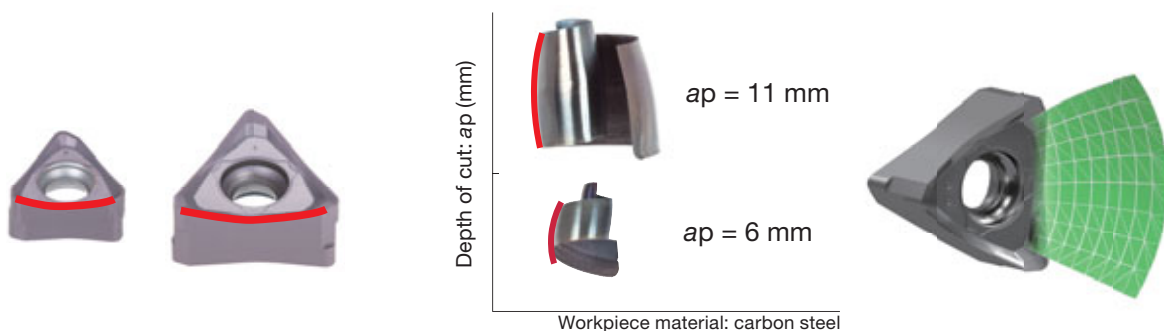
High efficiency

Inserts are available in 2 sizes for maximum density and cutting depths over conventional double-sided 6-edged inserts



High machining flexibility

The cutting edge is configured with a large curve with an optimal inclination, providing not only effective chip evacuation during heavy stock removal but also low cutting force in light depth of cut for machining stability



Economy

Precision insert molding technology provides high surface and wall finishing, while ensuring economy

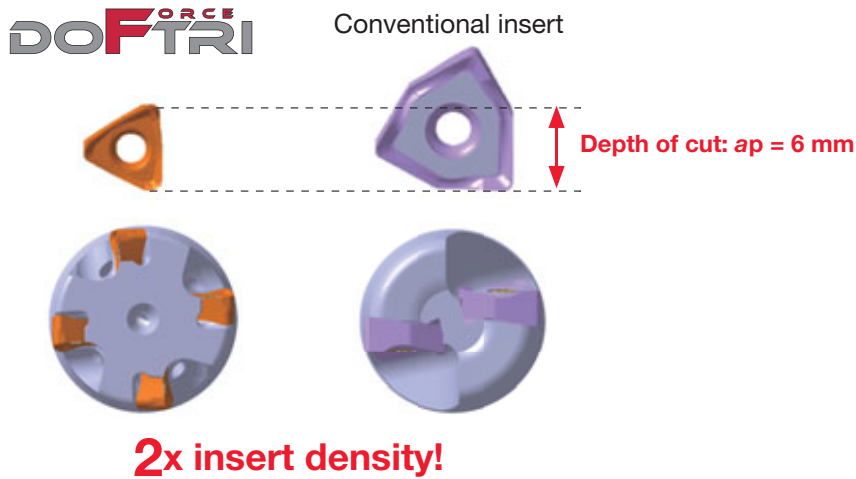
INSERT TYPES

New

■ Size 07 Insert

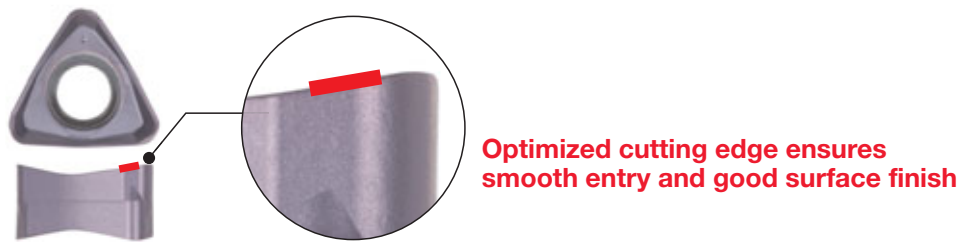
High insert density for efficiency

DoForce-Tri offers insert density of up to 2x as high as competitors' shoulder cutters of the same depth of cut, ensuring maximum efficiency thanks to its curved cutting edge with optimal inclination



Superior surface finishing

Every cutting edge is built with a wiper, thanks to the innovative flank design



■ Size 12 Insert

Insert lineup for various applications



TNMU-MJ

with built-in wipers
1st choice
Versatile geometry with good surface finish



TNGU-MJ

with built-in wipers
For close tolerance



TNMU-R-MJ

Radius insert
Strong cutting edge design with large corner radius



TNMU-NMJ

Serrated insert*
Ensures free cutting and good chip control during heavy milling

*Please see page 11 for instruction for use

Grade lineup for various materials

- A total of four grades, including two new CVD grades

PREMIUMTEC

TUNGALOY

AH3135



- PVD grade for high fracture resistance
- Most suitable for steel and stainless steel in general cutting parameters

AH120



- PVD grade with well-balanced wear and fracture resistance
- Ideal for general machining of steel and cast iron

T1215



- CVD grade with outstanding wear and chipping resistance
- Best for cast iron at high-speed machining

T3225



- CVD grade with excellent chipping and fracture resistance
- Most suited for steel and stainless steel at high-speed machining

PREMIUMTEC

TUNGALOY

Special Surface Technology

Enhanced coating resistance to chipping and peeling

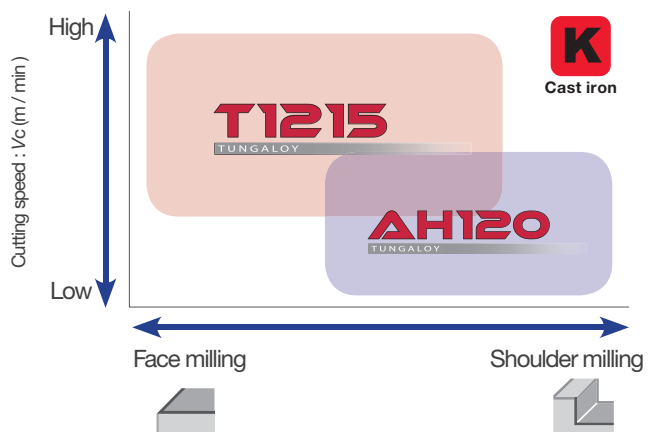
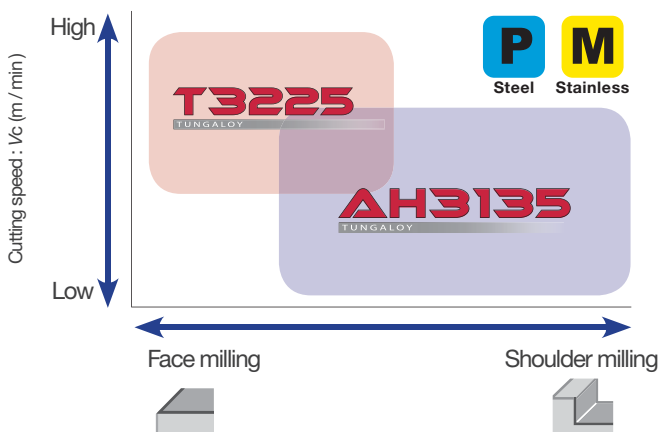
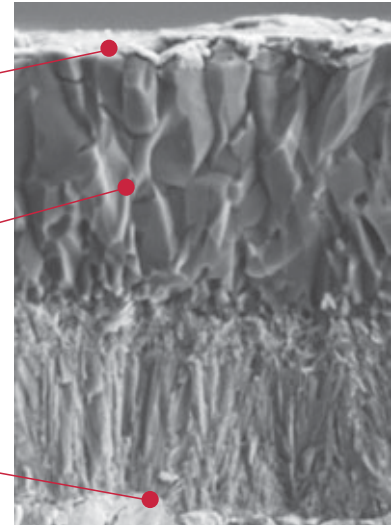
- Special surface post-treatment technology improves surface smoothness

Superior wear resistance in high speed cutting

- A thick alumina (Al₂O₃) layer improves insert life in high cutting temperature generated during high speed machining

Enhanced coating resistance to peeling

- Strong adhesion between the carbide substrate and the coating layer improves coating resistance to peeling

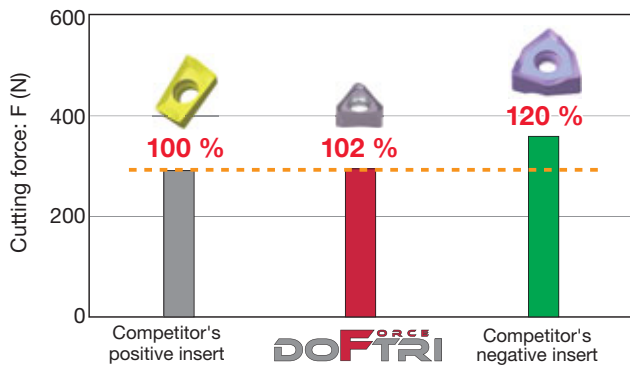


CUTTING PERFORMANCE

Low cutting force

New

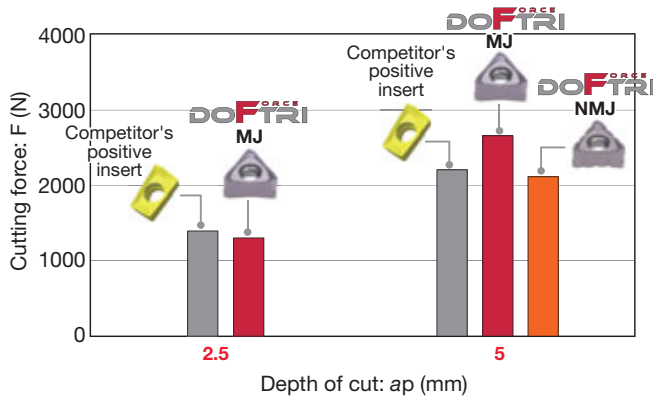
Size 07 insert



Cutter : EPTN07M025C25.0R04 (ø25 mm, z = 1)
 Insert : TNMU070308PER-MJ / AH3135
 Workpiece material : S55C / C55 (180 HB)
 Cutting speed : $V_c = 200$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 1.5$ mm
 Width of cut : $a_e = 15$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50

Unique cutting edge configuration can reduce cutting force to the same level produced by positive insert when $a_p \leq 1.5$ mm

Size 12 insert



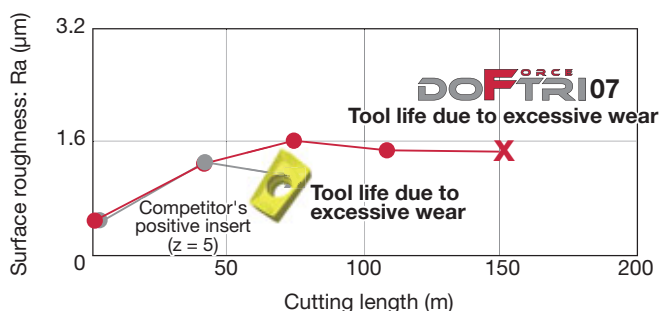
Cutter : TPTN12M050B22.0R04 (ø50 mm, z = 2)
 Insert : TNMU120708PER-MJ / AH3135
 TNMU120708PER-NMJ / AH3135
 Workpiece material : S55C / C55 (180 HB)
 Cutting speed : $V_c = 150$ m/min
 Feed per tooth : $f_z = 0.15$ mm/t
 Depth of cut : $a_p = 2.5, 5$ mm
 Width of cut : $a_e = 30$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50

The -MJ style insert ensures freer cutting than positive insert at light depths of cut. While the -NMJ insert provides lower cutting force at greater depths of cut.

High surface quality

New

Size 07 insert



Cutter : EPTN07M025C25.0R04 (ø25 mm, z = 4, Competitor: z = 5)
 Insert : TNMU070308PER-MJ / AH3135
 Workpiece material : S55C / C55 (180 HB)
 Cutting speed : $V_c = 200$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 3$ mm
 Width of cut : $a_e = 15$ mm
 Coolant : Dry
 Machine : Horizontal M/C, BT40

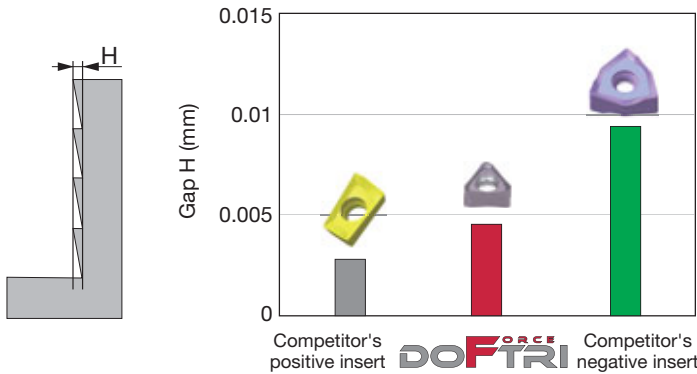
Built-in wiper provides quality surface finishing, while also prolonging insert life.

CUTTING PERFORMANCE

New

Wall accuracy

Size 07 insert



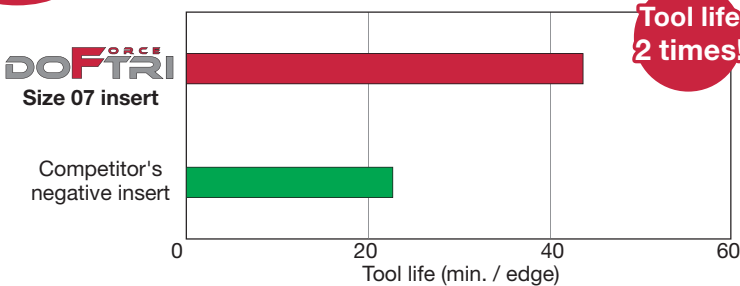
Cutter : EPTN07M025C25.0R04
($\phi 25$ mm, z = 4)
Insert : TNMU070308PER-MJ / AH3135
Workpiece material : S55C / C55 (180 HB)
Cutting speed : Vc = 200 m/min
Feed per tooth : fz = 0.1 mm/t
Depth of cut : ap = 3 mm x 3
Width of cut : ae = 6.25 mm
Coolant : Dry
Machine : Horizontal M/C, BT50

Optimized cutting edge provides good wall accuracy

Long tool life

New

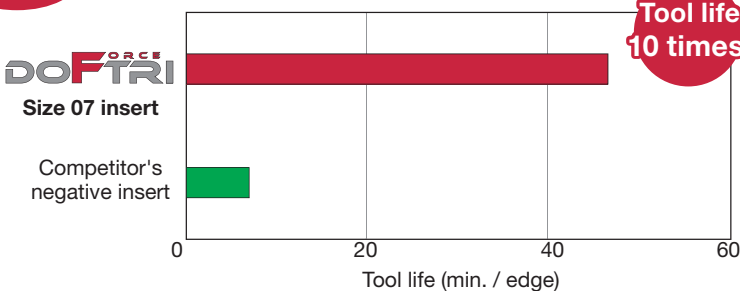
Tool life for steel



P Cutter : EPTN07M025C25.0R04
($\phi 25$ mm, z = 4)
Insert : TNMU070308PER-MJ / AH3135
Workpiece material : S55C / C55 (180 HB)
Cutting speed : Vc = 200 m/min
Feed per tooth : fz = 0.1 mm/t
Depth of cut : ap = 3 mm
Width of cut : ae = 15 mm
Coolant : Dry
Machine : Horizontal M/C, BT50

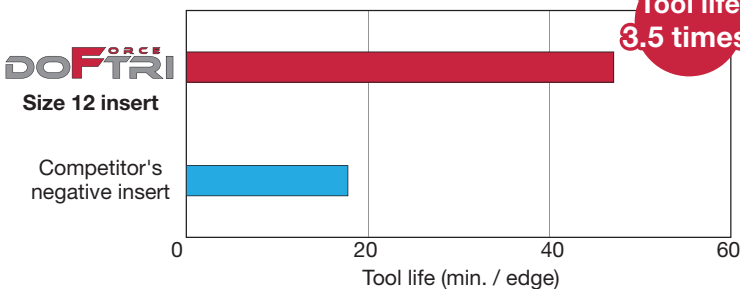
New

Tool life for cast iron



K Cutter : EPTN07M025C25.0R04
($\phi 25$ mm, z = 4)
Insert : TNMU070308PER-MJ / AH120
Workpiece material : FC250 / GG25 / 250
Cutting speed : Vc = 200 m/min
Feed per tooth : fz = 0.1 mm/t
Depth of cut : ap = 3 mm
Width of cut : ae = 15 mm
Coolant : Dry
Machine : Horizontal M/C, BT50

Tool life for stainless steel



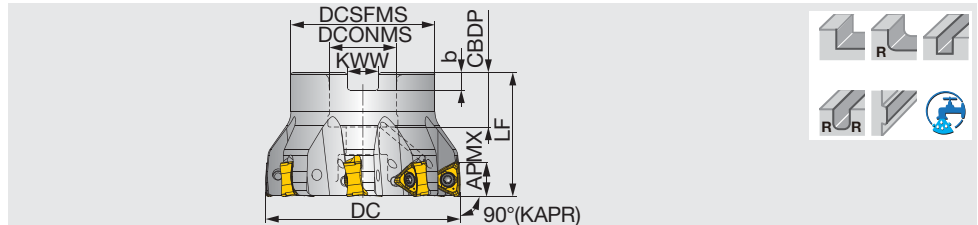
M Cutter : TPTN12M050B22.0R05
($\phi 50$ mm, z = 5)
Insert : TNMU120708PER-MJ / AH3135
Workpiece material : SUS304 / X5CrNi18-9
Cutting speed : Vc = 150 m/min
Feed per tooth : fz = 0.15 mm/t
Depth of cut : ap = 5 mm
Width of cut : ae = 30 mm
Coolant : Dry
Machine : Horizontal M/C, BT50

TPTN07

Square shoulder milling cutter with double-sided triangular inserts

GAMP = +4.2°~ +4.7°, GAMF = -15.4°~ -11.2°

New



Designation	APMX	DC	CICT	DCSFMS	LF ⁽¹⁾	DCONMS	CBDP	KWW	b	WT(kg)	Air hole	C.bolt	Insert
TPTN07M040B16.0R06	6.5	40	6	35	40	16	18	8.4	5.6	0.24	With	CM8X30H	TNNU0703...
TPTN07M050B22.0R08	6.5	50	8	47	40	22	20	10.4	6.3	0.41	With	CM10X30H	TNNU0703...

(1) The value is true with R0.8 insert. For R0.4, please refer to page 11.

SPARE PARTS



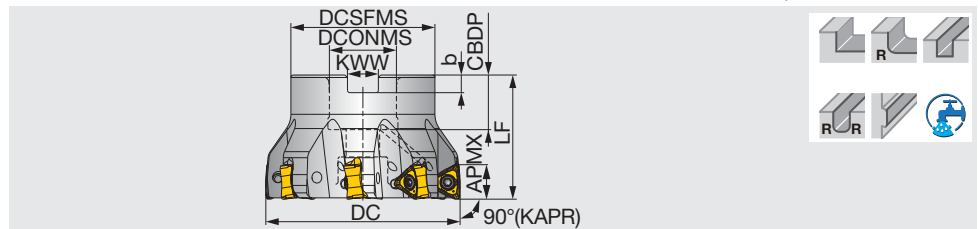
Designation	Clamping screw	Wrench
TPTN07...	CSPB-2.5SH	IP-7D

※ Torque (N·m): CSPB-2.5SH = 1.1

TPTN12

Square shoulder milling cutter with double-sided triangular inserts

GAMP = +4.2°~ +4.7°, GAMF = -15.4°~ -11.2°



Designation	APMX	DC	CICT	DCSFMS	LF	DCONMS	CBDP	KWW	b	WT(kg)	Air hole	C.bolt	Insert
TPTN12M050B22.0R04	11	50	4	47	40	22	20	10.4	6.3	0.4	With	CM10X30H	TN*U12...
TPTN12M050B22.0R05	11	50	5	47	40	22	20	10.4	6.3	0.4	With	CM10X30H	TN*U12...
TPTN12M063B22.0R05	11	63	5	47	40	22	20	10.4	6.3	0.6	With	CM10X30H	TN*U12...
TPTN12M063B22.0R06	11	63	6	47	40	22	20	10.4	6.3	0.6	With	CM10X30H	TN*U12...
TPTN12J080B25.4R06	11	80	6	58	50	25.4	26	9.5	6	1.1	With	CM12X30H	TN*U12...
TPTN12J080B25.4R08	11	80	8	58	50	25.4	26	9.5	6	1.1	With	CM12X30H	TN*U12...
TPTN12M080B27.0R06	11	80	6	58	50	27	22	12.4	7	1.1	With	CM12X30H	TN*U12...
TPTN12M080B27.0R08	11	80	8	58	50	27	22	12.4	7	1.1	With	CM12X30H	TN*U12...
TPTN12J100B31.7R07	11	100	7	67	50	31.75	32	12.7	8	1.4	With	TMBA-M16H	TN*U12...
TPTN12J100B31.7R10	11	100	10	67	50	31.75	32	12.7	8	1.4	With	TMBA-M16H	TN*U12...
TPTN12M100B32.0R07	11	100	7	67	50	32	28.5	14.4	8	1.4	With	TMBA-M16H	TN*U12...
TPTN12M100B32.0R10	11	100	10	67	50	32	28.5	14.4	8	1.4	With	TMBA-M16H	TN*U12...
TPTN12J125B38.1R08	11	125	8	71	63	38.1	38	15.9	10	2.4	With	TMBA-M20H	TN*U12...
TPTN12J125B38.1R12	11	125	12	71	63	38.1	38	15.9	10	2.5	With	TMBA-M20H	TN*U12...
TPTN12M125B40.0R08	11	125	8	71	63	40	32	16.4	9	2.3	With	TMBA-M20H	TN*U12...
TPTN12M125B40.0R12	11	125	12	71	63	40	32	16.4	9	2.4	With	TMBA-M20H	TN*U12...
New New TPTN12M160B40.0R10N	11	160	10	100	63	40	29	16.4	9	4.5	Without	-	TN*U12...
TPTN12J160B50.8R10N	11	160	10	100	63	50.8	41	19	11	4.5	Without	-	TN*U12...

SPARE PARTS



Designation	Clamping screw	Grip	Torx bit	Lubricant	Shell locking bolt	Shell locking bolt1
TPTN12M050, 063B...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000	-	CM10X30H
TPTN12*080B...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000	-	CM12X30H
TPTN12*100B...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000	TMBA-M16H	-
TPTN12*125B...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000	TMBA-M20H	-
TPTN12*160B...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000	-	-

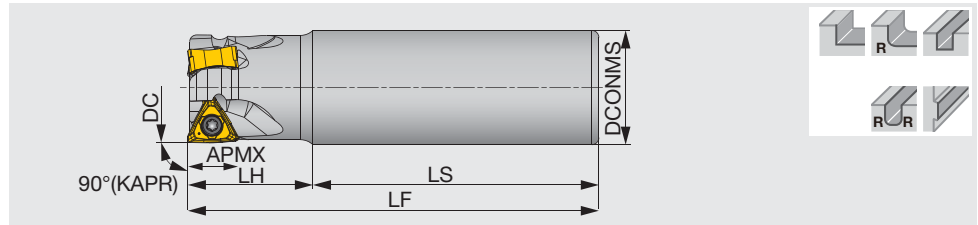
※ Torque (N·m): CSPB-3.5 = 3.5

EPTN07

Square shoulder end mill with double-sided triangular inserts

GAMP = +4.2° ~ +4.7°, GAMF = -15.4° ~ -11.2°

New



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF ⁽¹⁾	WT(kg)	Air hole	Insert
EPTN07M018C16.0R02	6.5	18	2	16	60	25	85	0.13	With	TN ^μ U0703..
EPTN07M020C20.0R02	6.5	20	2	20	70	30	100	0.22	With	TN ^μ U0703..
EPTN07M020C20.0R02L	6.5	20	2	20	135	50	185	0.41	With	TN ^μ U0703..
EPTN07M020C20.0R03	6.5	20	3	20	70	30	100	0.215	With	TN ^μ U0703..
EPTN07M025C25.0R03	6.5	25	3	25	80	35	115	0.41	With	TN ^μ U0703..
EPTN07M025C25.0R03L	6.5	25	3	25	150	70	220	0.78	With	TN ^μ U0703..
EPTN07M025C25.0R04	6.5	25	4	25	80	35	115	0.41	With	TN ^μ U0703..
EPTN07M032C32.0R04	6.5	32	4	32	80	35	115	0.66	With	TN ^μ U0703..
EPTN07M032C32.0R05	6.5	32	5	32	80	35	115	0.67	With	TN ^μ U0703..

(1) The value is true with R0.8 insert. For R0.4, please refer to page 11.

SPARE PARTS



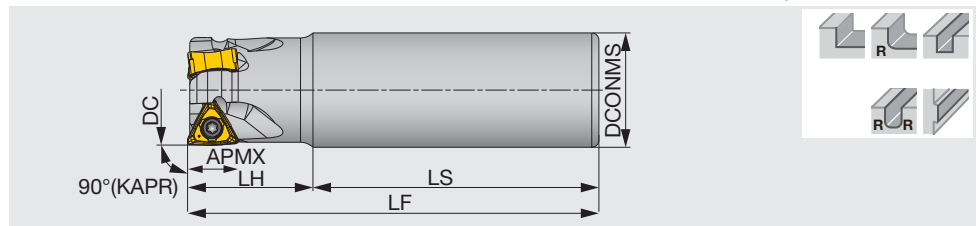
Designation	Clamping screw	Wrench
EPTN07...	CSPB-2.5SH	IP-7D

※ Torque (N·m): CSPB-2.5SH = 1.1

EPTN12

Square shoulder end mill with double-sided triangular inserts

GAMP = +4.2° ~ +4.7°, GAMF = -15.4° ~ -11.2°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPTN12M032C32.0R02N	11	32	2	32	80	35	115	0.7	Without	TN ^μ U12...
EPTN12M032C32.0R03N	11	32	3	32	80	35	115	0.7	Without	TN ^μ U12...
EPTN12M040C32.0R03N	11	40	3	32	80	35	115	0.8	Without	TN ^μ U12...
EPTN12M040C32.0R04N	11	40	4	32	80	35	115	0.8	Without	TN ^μ U12...

SPARE PARTS



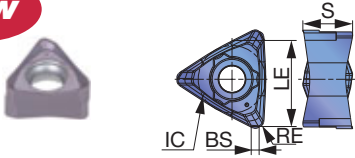
Wrench	Clamping screw	Grip	Torx bit	Lubricant
EPTN12...	CSPB-3.5	H-TB2W	BLDIP15/S7	M-1000

※ Torque (N·m): CSPB-3.5 = 3.5

INSERT

TNMU07-MJ

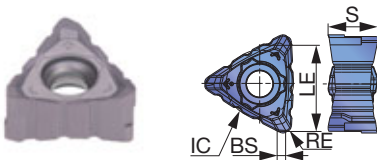
New



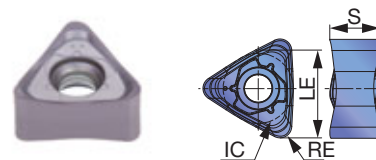
TNGU12-MJ/TNMU12-MJ



TNMU12-NMJ



TNMU12-R-MJ



P Steel	☆	★	☆
M Stainless		★	☆
K Cast iron	★		☆
N Non-ferrous			
S Superalloys	★	☆	
H Hard materials			

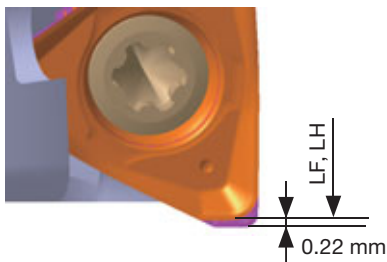
★:First choice
☆:Second choice

Designation	RE	APMX	Coated				LE	IC	S	BS
			AH120	AH3135	T1215	T3225				
New TNMU070304PER-MJ	0.4	6.5	●	●			6.5	5.7	4.1	0.6
New TNMU070308PER-MJ	0.8	6.5	●	●			6.5	5.7	4.1	0.6
TNGU120708PER-MJ	0.8	11	●	●	●		12	9.525	7.04	1.16
TNMU120708PER-MJ	0.8	11	●	●	●	●	12	9.525	7.04	1.16
TNMU120708PER-NMJ	0.8	11	●	●			12	9.525	7.04	1.16
TNMU1207R16PER-MJ	1.6	11	●	●			12	9.525	7.04	-

●: New product
●: Line up

Notes

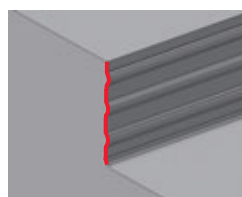
LF and LH dimensions for R0.4 mm, size 07 insert



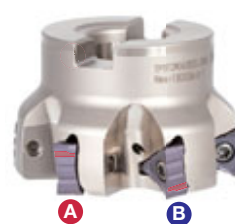
Add 0.22 mm to LH and LF measurements when R0.4 mm insert is used

Serrated size 12 insert

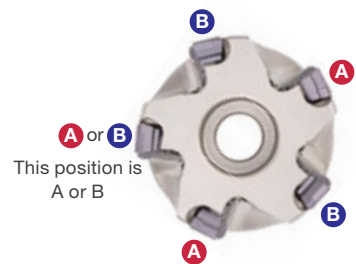
To obtain good wall accuracy, the serrated inserts must be arranged in alternative orders on the cutter so that the same serrated edge will not cut the same surface twice, generating steps on the wall. One of the serration grooves (marked in red) on the cutting edge has an irregular shape, and this must be placed alternatively as shown below by A and B.



Check the insert orientations if steps are produced on the wall surface.



The groove in red is asymmetric for easy identification



This position is A or B

Insert orientation for odd number of teeth

STANDARD CUTTING CONDITIONS: Size 07 inserts

New

ISO	Workpiece materials	Hardness	Priority	Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
P	Low carbon steel (S15C / C15E4, SS400 / E275A, etc.)	- 200 HB	First choice	AH3135	100 - 250	0.07 - 0.2
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)	- 300 HB	First choice	AH3135	100 - 230	0.07 - 0.15
	Prehardened steel (NAK80, PX5, etc.)	30 - 40 HRC	First choice	AH3135	100 - 180	0.07 - 0.15
M	Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)	-	First choice	AH3135	90 - 200	0.07 - 0.15
K	Grey cast iron (FC250 / GG25 / 250, FC300 / GG30 / 300, etc.)	150 - 250 HB	First choice	AH120	140 - 250	0.07 - 0.2
	Ductile cast iron (FCD400, FCD600 / GGG60 / 600-3, etc.)	150 - 250 HB	First choice	AH120	110 - 200	0.07 - 0.15
S	Titanium alloys (Ti-6Al-4V, etc.)	-	First choice	AH3135	20 - 60	0.07 - 0.15
	Heat-resistant alloys (Inconel718, etc.)	-	First choice	AH120	20 - 40	0.07 - 0.1

STANDARD CUTTING CONDITIONS: Size 12 inserts

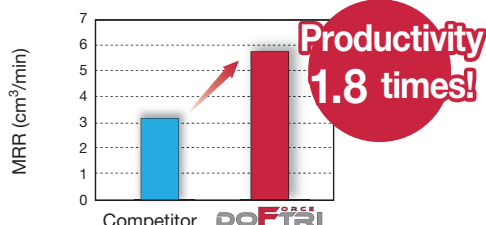
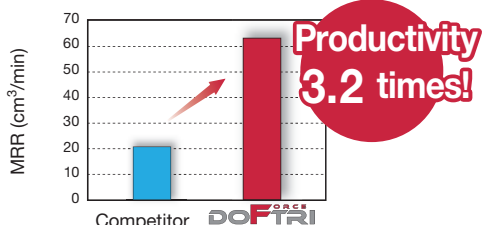
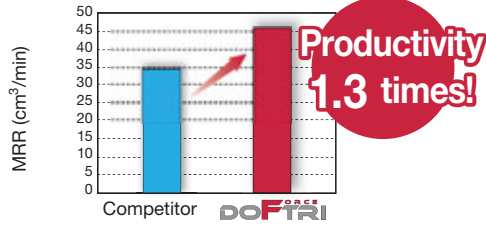
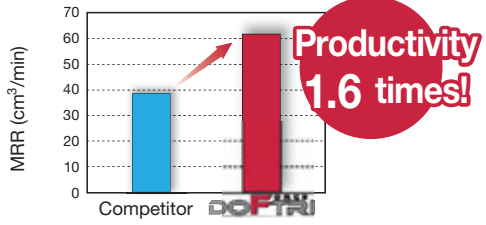
ISO	Workpiece materials	Hardness	Priority	Grades	Chip-breaker	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
P	Low carbon steel (S15C / C15E4, SS400 / E275A, etc.)	- 200 HB	First choice	AH3135	MJ	100 - 250	0.08 - 0.3
		- 200 HB	Priority on wear resistance	T3225	MJ	100 - 300	0.08 - 0.3
		- 200 HB	For low cutting force	AH3135	NMJ	100 - 250	0.08 - 0.14
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)	- 300 HB	First choice	AH3135	MJ	100 - 230	0.08 - 0.3
		- 300 HB	Priority on wear resistance	T3225	MJ	100 - 280	0.08 - 0.3
		- 300 HB	For low cutting force	AH3135	NMJ	100 - 230	0.08 - 0.14
	Prehardened steel (NAK80, PX5, etc.)	30 - 40 HRC	First choice	AH3135	MJ	100 - 180	0.08 - 0.25
		30 - 40 HRC	Priority on wear resistance	T3225	MJ	100 - 200	0.08 - 0.25
		30 - 40 HRC	For low cutting force	AH3135	NMJ	100 - 180	0.08 - 0.14
M	Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)	-	First choice	AH3135	MJ	90 - 200	0.08 - 0.25
		-	Priority on wear resistance	T3225	MJ	90 - 250	0.08 - 0.25
		-	For low cutting force	AH3135	NMJ	90 - 200	0.08 - 0.14
K	Grey cast iron (FC250 / GG25 / 250, FC300 / GG30 / 300, etc.)	150 - 250 HB	First choice	AH120	MJ	140 - 250	0.08 - 0.3
		150 - 250 HB	Priority on wear resistance	T1215	MJ	140 - 300	0.08 - 0.3
		150 - 250 HB	For low cutting force	AH120	NMJ	140 - 250	0.08 - 0.14
	Ductile cast iron (FCD400, FCD600 / GGG60 / 600-3, etc.)	150 - 250 HB	First choice	AH120	MJ	110 - 200	0.08 - 0.25
		150 - 250 HB	Priority on wear resistance	T1215	MJ	110 - 250	0.08 - 0.25
		150 - 250 HB	For low cutting force	AH120	NMJ	110 - 200	0.08 - 0.14
S	Titanium alloys (Ti-6Al-4V, etc.)	-	First choice	AH3135	MJ	20 - 60	0.08 - 0.2
		-	For low cutting force	AH3135	NMJ	20 - 60	0.08 - 0.14
	Heat-resistant alloys (Inconel718, etc.)	-	First choice	AH120	MJ	20 - 40	0.07 - 0.18
		-	For low cutting force	AH120	NMJ	20 - 40	0.07 - 0.14

Note: For NMJ chipbreaker, use a feed rate that satisfies the following theoretical chip thickness:

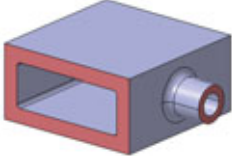
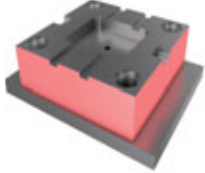
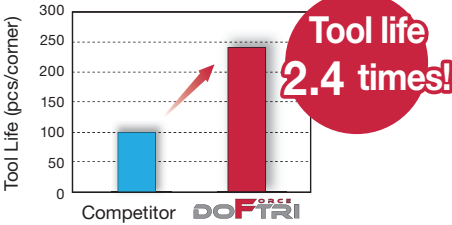
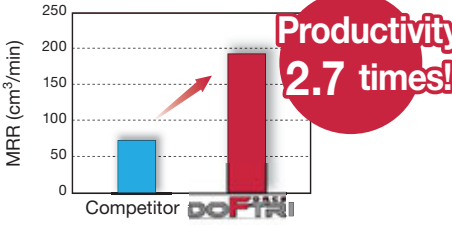


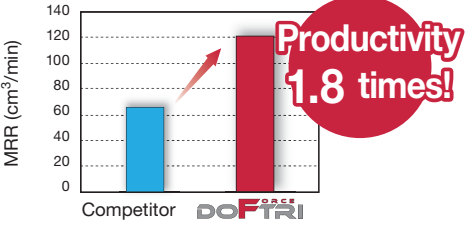
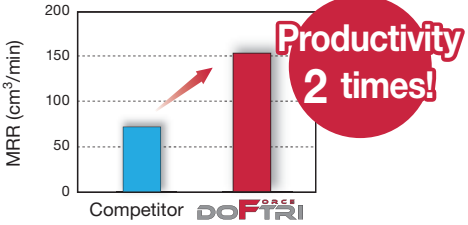
Designation	Chip thickness (mm)
TNMMU120708PER-NMJ	< 0.2

PRACTICAL EXAMPLES: Size 07 inserts

New

Workpiece type		Machine part	Machine part
Cutter		EPTN07M025C25.0R04 (ø25, z = 4)	EPTN07M025C25.0R04 (ø25, z = 4)
Insert		TNMU070308PER-MJ	TNMU070308PER-MJ
Grade		AH3135	AH3135
Workpiece material		SS400 / E275A	SUS304 / X5CrNi18-9
Cutting conditions			
Cutting speed: Vc (m/min)		298	196
Feed per tooth: fz (mm/t)		0.118	0.13
Feed speed: Vf (m/min)		1800	1298
Depth of cut: ap (mm)		0.2	2
Width of cut: ae (mm)		16	25
Method of machining		Face milling	Grooving
Coolant		Emulsion	Air
Machine		Horizontal M/C, BT30	Horizontal M/C, BT40
Results		 <p>Productivity 1.8 times!</p> <p>The light cutting geometry provided 1.8x greater MRR on a BT30 spindle over competitor's positive inserts. No compromise for tool life and surface finishing quality</p>	 <p>Productivity 3.2 times!</p> <p>MRR has been improved by 3.2x over the competitor's positive inserts thanks to higher number of teeth on the cutter increasing feed per tooth. No sacrifice for surface quality.</p>
Workpiece type		Bearing housing	Bracket
Cutter		EPTN07M032C32.0R05 (ø32, z = 5)	EPTN07M025C25.0R04 (ø25, z = 4)
Insert		TNMU070308PER-MJ	TNMU070308PER-MJ
Grade		AH3135	AH120
Workpiece material		FC250 / GG25 / 250	FCD400
Cutting conditions			
Cutting speed: Vc (m/min)		320	180
Feed per tooth: fz (mm/t)		0.06	0.08
Feed speed: Vf (m/min)		960	690
Depth of cut: ap (mm)		2	4
Width of cut: ae (mm)		24	22
Method of machining		Grooving	Face milling
Coolant		Air	Air
Machine		Horizontal M/C, BT40	Vertical M/C, BT40
Results		 <p>Productivity 1.3 times!</p> <p>MRR has been improved by 1.3x over the competitor's positive inserts thanks to higher number of teeth and increased feed per tooth</p>	 <p>Productivity 1.6 times!</p> <p>Inserts' free cutting action eliminated chatter despite higher number of cutting edges, improving MRR by 1.6x</p>

PRACTICAL EXAMPLES: Size 12 inserts

Workpiece type		Carrier	Mold base	
Cutter		TPTN12R063M22.0E06 (ø63, z = 6)	TPTN12J080B25.4R06 (ø80, z = 6)	
Insert		TNGU120708PER-MJ	TNMU120708PER-MJ	
Grade		AH120	AH120	
Workpiece material		Pearlitic cast iron (250 HB)  K	 K	
Cutting conditions	Cutting speed: V_c (m/min)	150	200	
	Feed per tooth: f_z (mm/t)	0.2	0.2	
	Feed speed: V_f (m/min)	950	965	
	Depth of cut: a_p (mm)	6	5	
	Width of cut: a_e (mm)	20	40	
	Method of machining	Face milling	Shoulder milling	
	Coolant	Emulsion	Emulsion	
Machine		Horizontal M/C, BT50	Horizontal M/C, BT50	
Results	 <p>The combination of special insert geometry and grade for inserts in DoForce-Tri series helps extend tool life compared to the competitor.</p>		 <p>The competitor's shoulder mill chattered at high cutting parameters. DoForce-Tri's helical cutting edges produced high wall accuracy at double cutting speed and 1.7x greater depth of cut.</p>	
	<p>Workpiece type</p> <p>Cutter</p> <p>Insert</p> <p>Grade</p>		<p>Machine part</p> <p>Crankshaft</p>	
Workpiece material		 P	New  P	
Cutting conditions	Cutting speed: V_c (m/min)	251	135	
	Feed per tooth: f_z (mm/t)	0.14	0.157	
	Feed speed: V_f (m/min)	1119	420	
	Depth of cut: a_p (mm)	4	3	
	Width of cut: a_e (mm)	27	125	
	Method of machining	Shoulder milling	Shoulder milling	
	Coolant	None	Air blow	
Machine		Horizontal M/C, BT40	Horizontal boring M/C, BT50	
Results	 <p>DoForce-Tri's -NMJ chipbreaker with serrations reduced cutting force eliminating chatter. MRR has been improved to double the depth of cut with long and stable tool life.</p>		 <p>The competitor's shoulder mill chattered at high cutting parameters. DoForce-Tri's helical cutting edges produced stable machining at 1.7 times number of teeth and 1.2 times depth of cut.</p>	

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