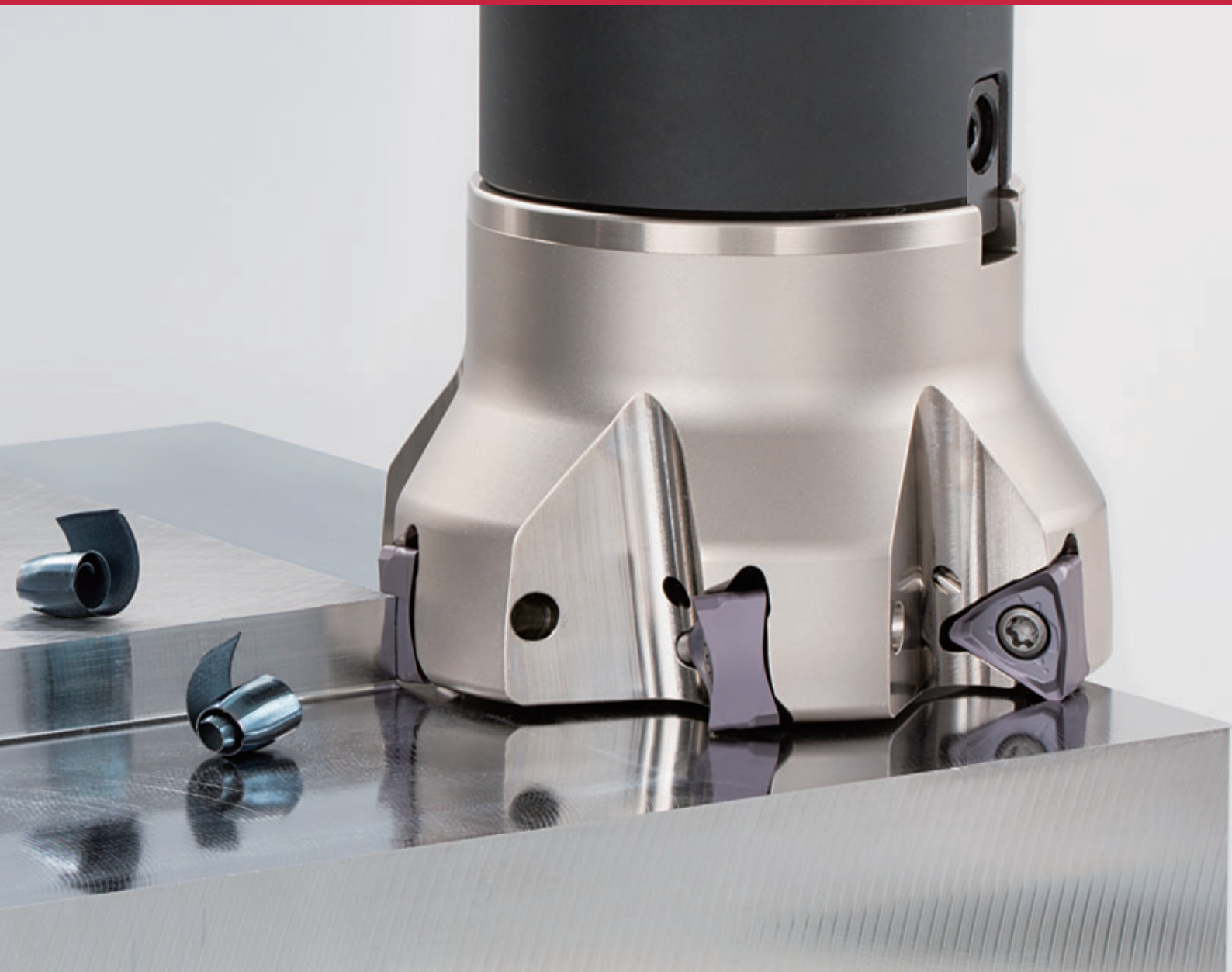


Cost-effective shoulder milling cutter for **high productivity**





ACCELERATED MACHINING

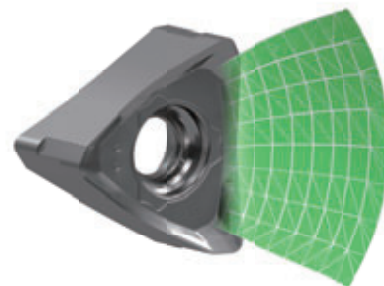
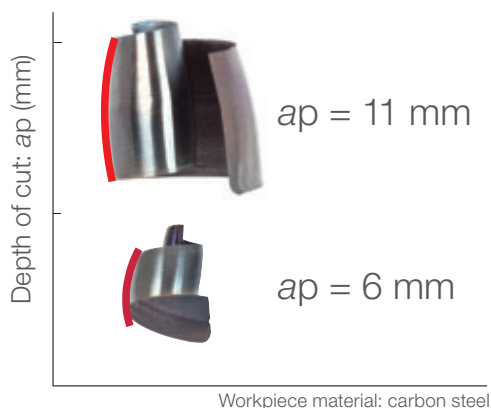
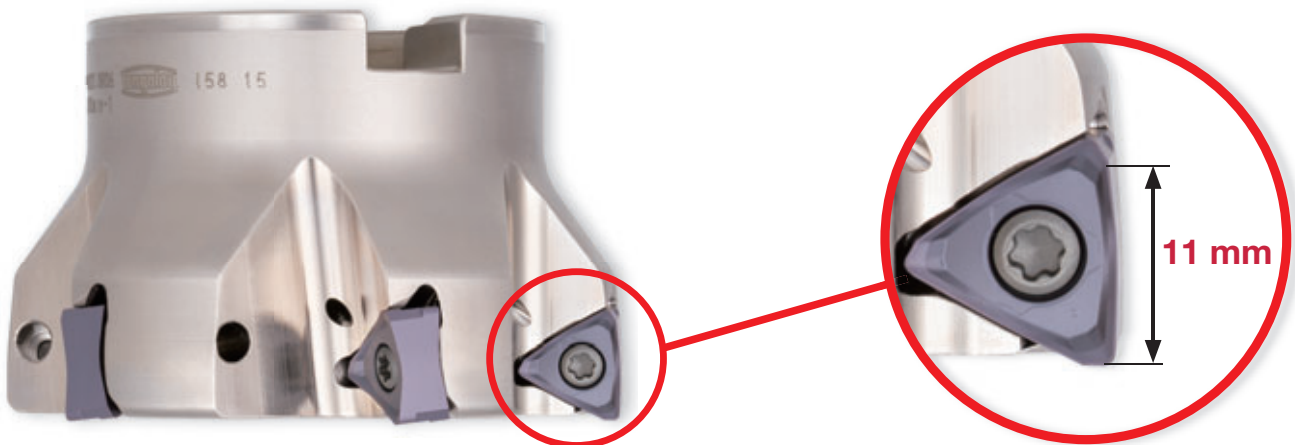


DoForce-Tri is a new series of tools with double-sided triangular insert performing **general milling applications with superior advantages.**

High-precision shoulder milling cutter with economical double-sided triangular inserts

Insert features:

- 6-cornered design for economic advantage
- Fully effective cutting edge length in square shoulder milling
- Low cutting force even in large depth of cut
- Concave cutting edge & optimized rake angle form barrel-shaped chips, delivering smooth chip evacuation



INSERT TYPES

New



TNMU-MJ
with built-in
wipers



TNGU-MJ
with built-in
wipers

- Available in M-class tolerance
- Wiper edge for high-quality surface finish
- Ground insert for high wall accuracy
- Unique flank design on the corner allows wiper to be effective all 6 edges.



TNMU-MJ
Radius insert

- Insert with round corner for high toughness
- Large rake angle reduces cutting force.
- Insert shape suitable for both R- & L-hand* cutter bodies
(*: Left-hand body will be available upon request.)

New



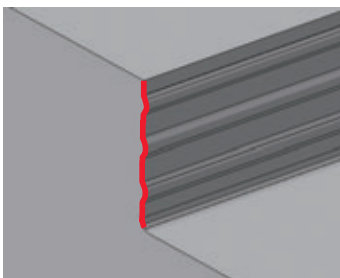
TNMU-NMJ
Serrated insert



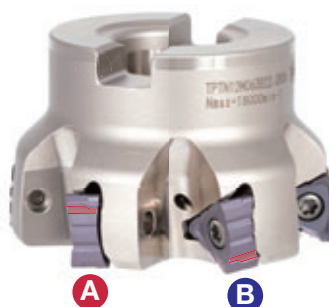
TNGU-NMJ
Serrated insert

- **Available in M-class tolerance**
- Serrated cutting edges create small chips, reducing cutting force and chip volume.
- Eliminates vibration on long-overhang tool
- Suitable for large depth of cut in face milling
- Each insert has asymmetrical serrations on the cutting edge of Side-A and Side-B to achieve good wall surface quality*.

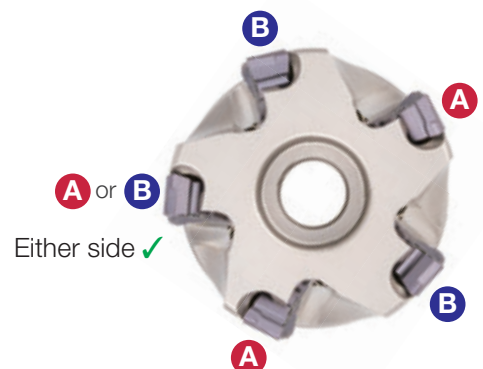
* Side A and Side B must be placed alternately in adjacent pockets.
Note: Side A and Side B can be identified by locating the tapered serration on the insert flank as highlighted below in red.



In case step marks appear on the surface as shown above, re-arrange the inserts in order.



Asymmetrical groove on
sides A and B



Either side ✓

Insert positioning for the cutter
with pockets in odd number

Rich grade lineup for every kind of material

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

PREMIUMTEC TUNGALOY

AH3135



Steel Stainless

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

AH120



Steel Cast iron

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

New

T1215



Cast iron

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

New

T3225



Steel Stainless

- 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

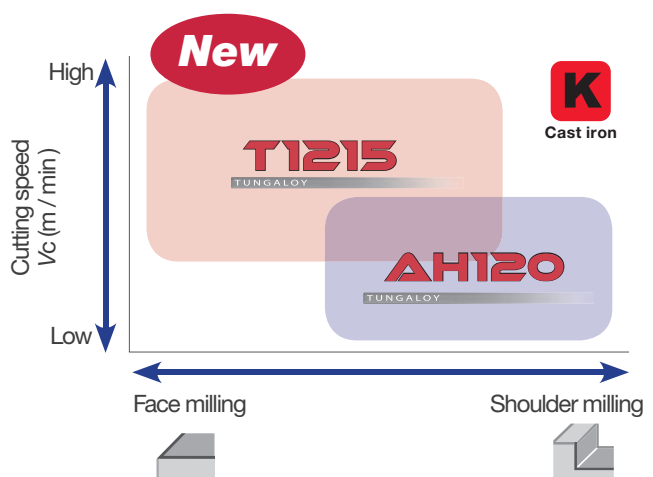
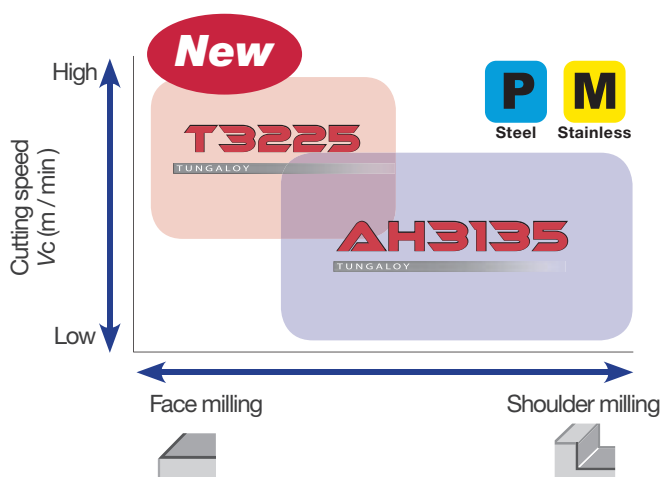
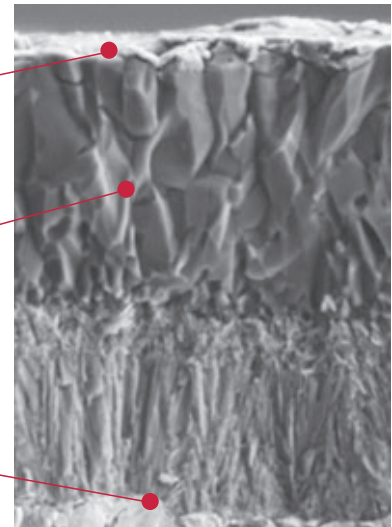
- Special surface post-treatment technology improves surface smoothness

Superior wear resistance in high speed cutting

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

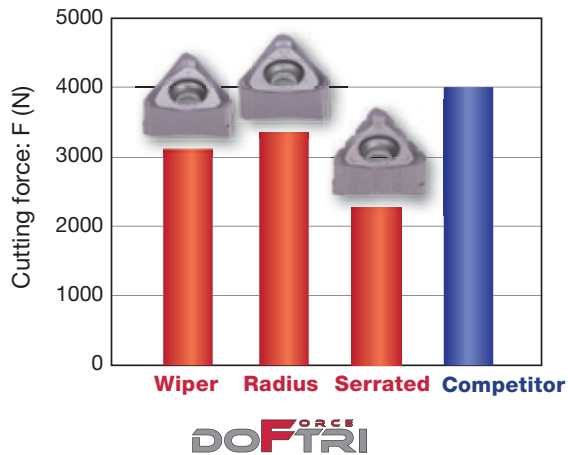
Enhanced coating resistance to peeling

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



CUTTING PERFORMANCE

Cutting force



Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNGU120708PER-MJ / AH3135 (Wiper)
 TNMU1207R16PER-MJ / AH3135 (Radius)
 TNGU120708PER-NMJ / AH3135 (Serrated)

Workpiece material: S55C / C55 (200HB)

Cutting speed : $V_c = 150$ m/min

Feed per tooth : $f_z = 0.15$ mm/t

Depth of cut : $a_p = 5$ mm

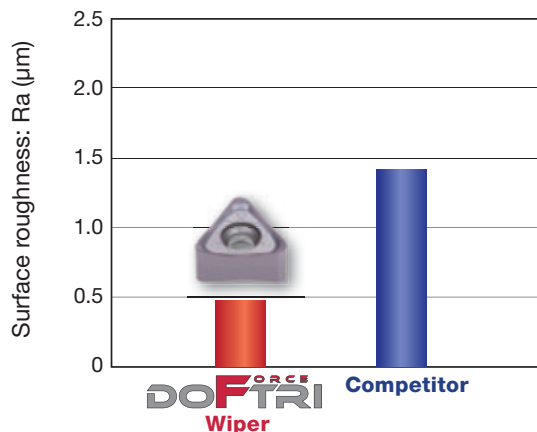
Width of cut : $a_e = 30$ mm

Coolant : Dry

Machine : Vertical M/C, BT50, 30kW

Concave cutting edge and optimized rake angle reduce cutting force.

Surface roughness



Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 5$)

Insert : TNGU120708PER-MJ / AH3135

Workpiece material: S55C / C55 (200HB)

Cutting speed : $V_c = 150$ m/min

Feed per tooth : $f_z = 0.2$ mm/t

Depth of cut : $a_p = 5$ mm

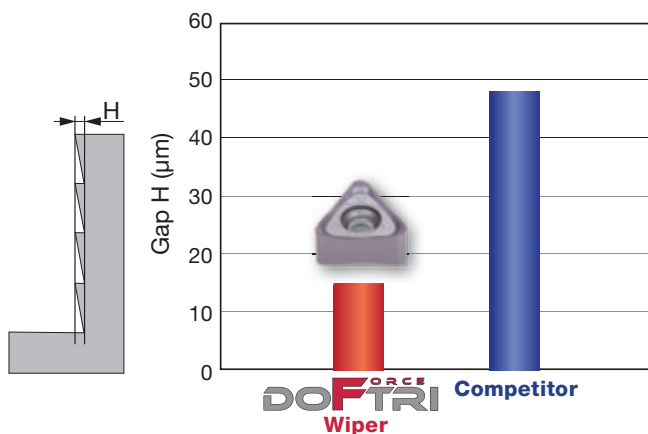
Width of cut : $a_e = 30$ mm

Coolant : Dry

Machine : Vertical M/C, BT50, 30kW

Wiper edge achieves better surface finish.

Wall accuracy



Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 5$)

Insert : TNGU120708PER-MJ / AH3135

Workpiece material: S55C / C55 (200HB)

Cutting speed : $V_c = 150$ m/min

Feed per tooth : $f_z = 0.15$ mm/t

Depth of cut : $a_p = 5$ mm x 4 passes

Width of cut : $a_e = 15$ mm

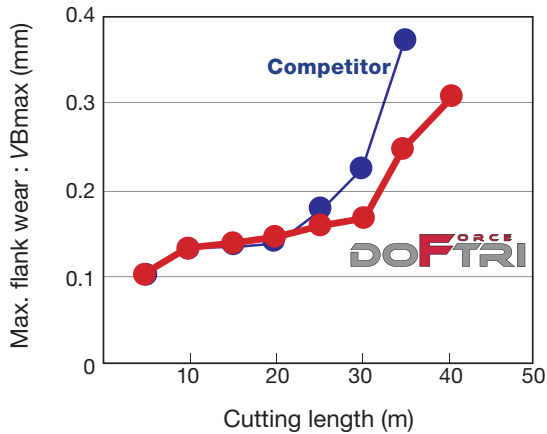
Coolant : Dry

Machine : Vertical M/C, BT50, 30kW

Optimized cutting edge geometry provides high wall accuracy.

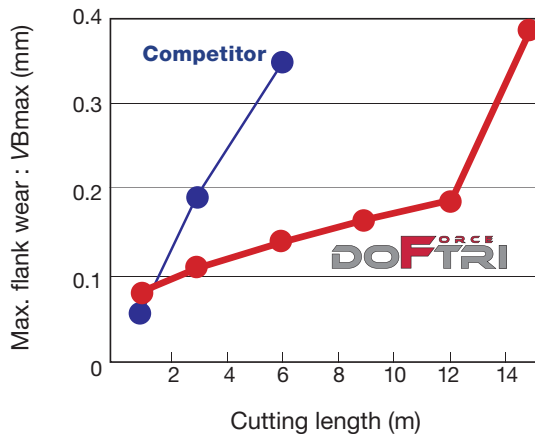
CUTTING PERFORMANCE

Tool life in machining steel



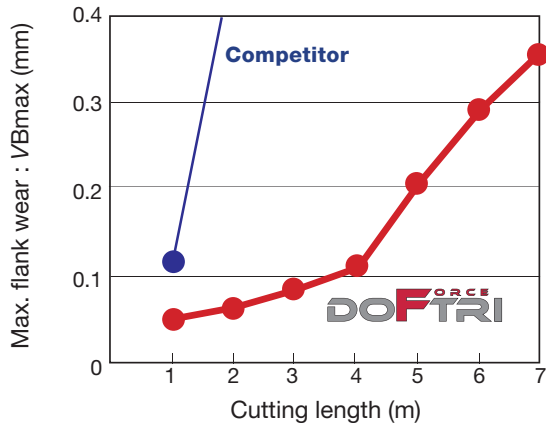
Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNMU120708PER-MJ / AH3135
 Workpiece material : S55C / C55 (180HB)
 Cutting speed : $V_c = 150$ m/min
 Feed per tooth : $f_z = 0.15$ mm/t
 Depth of cut : $a_p = 5$ mm
 Width of cut : $a_e = 30$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50

Tool life in machining cast iron



Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNMU120708PER-MJ / AH120
 Workpiece material : FC250 / 250 / GG25
 Cutting speed : $V_c = 200$ m/min
 Feed per tooth : $f_z = 0.2$ mm/t
 Depth of cut : $a_p = 5$ mm
 Width of cut : $a_e = 34$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50

Tool life in machining stainless steel



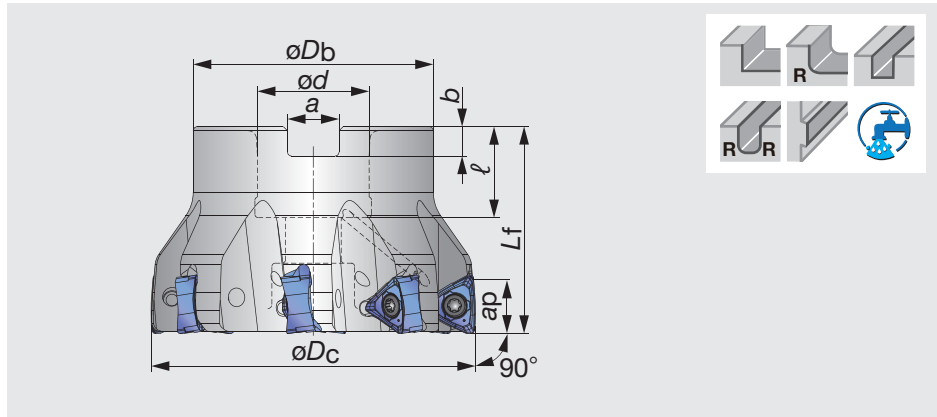
Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNMU120708PER-MJ / AH3135
 Workpiece material : SUS304 / X5CrNi18-9
 Cutting speed : $V_c = 150$ m/min
 Feed per tooth : $f_z = 0.15$ mm/t
 Depth of cut : $a_p = 5$ mm
 Width of cut : $a_e = 30$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50

Square shoulder milling cutters with double-sided triangular insert

CUTTER - BORE TYPE

DoForce-Tri TPTN12

A.R. = +4.2°~ +4.7°, R.R. = -15.4°~ -11.2°



Designation	Max. ap	ϕD_c	z	ϕD_b	L_f	ϕd	ℓ	a	b	Kg	C.bolt	Insert	Torque*
TPTN12M050B22.0R04	11	50.00	4	47	40.0	22.000	20.00	10.40	6.30	0.40	CM10X30H	TN*U12...	3.5
TPTN12M050B22.0R05	11	50.00	5	47	40.0	22.000	20.00	10.40	6.30	0.40	CM10X30H	TN*U12...	3.5
TPTN12M063B22.0R05	11	63.00	5	47	40.0	22.000	20.00	10.40	6.30	0.60	CM10X30H	TN*U12...	3.5
TPTN12M063B22.0R06	11	63.00	6	47	40.0	22.000	20.00	10.40	6.30	0.60	CM10X30H	TN*U12...	3.5
TPTN12J080B25.4R06	11	80.00	6	58	50.0	25.400	26.00	9.50	6.00	1.10	CM12X30H	TN*U12...	3.5
TPTN12J080B25.4R08	11	80.00	8	58	50.0	25.400	26.00	9.50	6.00	1.10	CM12X30H	TN*U12...	3.5
TPTN12M080B27.0R06	11	80.00	6	58	50.0	27.000	22.00	12.40	7.00	1.10	CM12X30H	TN*U12...	3.5
TPTN12M080B27.0R08	11	80.00	8	58	50.0	27.000	22.00	12.40	7.00	1.10	CM12X30H	TN*U12...	3.5
TPTN12J100B31.7R07	11	100.00	7	67	50.0	31.750	32.00	12.70	8.00	1.40	TMBA-M16H	TN*U12...	3.5
TPTN12J100B31.7R10	11	100.00	10	67	50.0	31.750	32.00	12.70	8.00	1.40	TMBA-M16H	TN*U12...	3.5
TPTN12M100B32.0R07	11	100.00	7	67	50.0	32.000	28.50	14.40	8.00	1.40	TMBA-M16H	TN*U12...	3.5
TPTN12M100B32.0R10	11	100.00	10	67	50.0	32.000	28.50	14.40	8.00	1.40	TMBA-M16H	TN*U12...	3.5
TPTN12J125B38.1R08	11	125.00	8	71	63.0	38.100	38.00	15.90	10.00	2.40	TMBA-M20H	TN*U12...	3.5
TPTN12J125B38.1R12	11	125.00	12	71	63.0	38.100	38.00	15.90	10.00	2.50	TMBA-M20H	TN*U12...	3.5
TPTN12M125B40.0R08	11	125.00	8	71	63.0	40.000	32.00	16.40	9.00	2.30	TMBA-M20H	TN*U12...	3.5
TPTN12M125B40.0R12	11	125.00	12	71	63.0	40.000	32.00	16.40	9.00	2.40	TMBA-M20H	TN*U12...	3.5

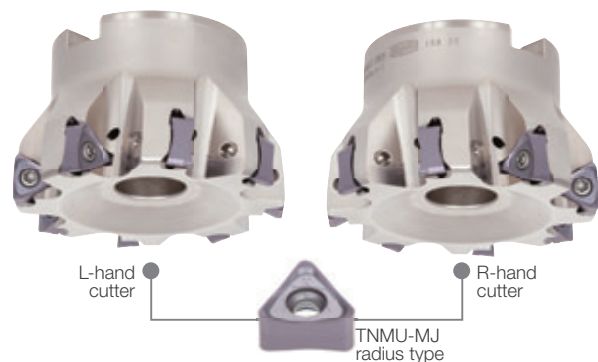
*Torque: Recommended torque (N·m) for clamping

SPARE PARTS



Clamping screw	Torx Bit	Wrench
CSPB-3.5	BLDIP15/S7	Grip H-TB2W

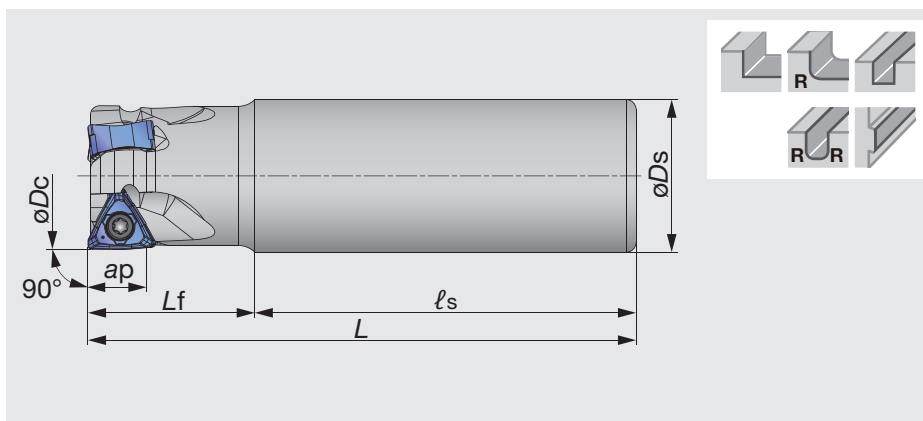
Left-hand body will be available upon request - can be used only with TNMU-MJ insert



Square shoulder milling cutters with double-sided triangular insert

CUTTER - SHANK TYPE

DoForce-Tri EPTN12



Designation	Max. a_p	ϕD_c	z	ϕD_s	ℓ_s	L_f	L	Kg	Insert	Torque*
EPTN12M032C32.0R02N	11	32.00	2	32.0	80.0	35.0	115.0	0.70	TN*U12...	3.5
EPTN12M032C32.0R03N	11	32.00	3	32.0	80.0	35.0	115.0	0.70	TN*U12...	3.5
EPTN12M040C32.0R03N	11	40.00	3	32.0	80.0	35.0	115.0	0.80	TN*U12...	3.5
EPTN12M040C32.0R04N	11	40.00	4	32.0	80.0	35.0	115.0	0.80	TN*U12...	3.5

*Torque: Recommended torque (N-m) for clamping

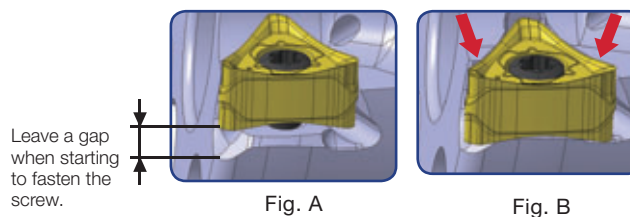
SPARE PARTS



Clamping screw	Wrench	
	Torx Bit	Grip
CSPB-3.5	BLDIP15/S7	H-TB2W

Installation of inserts

- On a cutter, the screw hole of an insert pocket is placed at an angle.
- Leave a gap between the insert and pocket when starting to fasten the screw on the cutter body as shown in Fig. A.
- After fastening the screw, please ensure that there is no gap between the cutter body and insert. (Fig. B)



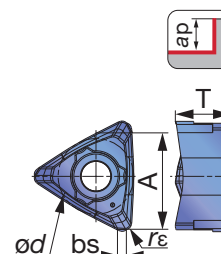
INSERT

New

TNMU-MJ



TNGU-MJ

**New**

TNMU-NMJ



TNGU-NMJ



TNMU-R-MJ



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

★ : First choice
☆ : Second choice

Designation	rε	Max. ap	Coated				A	ød	T	bs
			AH120	AH3135	T1215	T3225				
TNMU120708PER-MJ	0.8	11	●	●	●	●	12	9.525	7.04	1.16
TNGU120708PER-MJ	0.8	11	●	●			12	9.525	7.04	1.16
TNMU120708PER-NMJ	0.8	11	●	●			12	9.525	7.04	1.16
TNGU120708PER-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

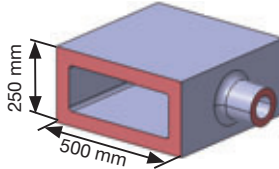
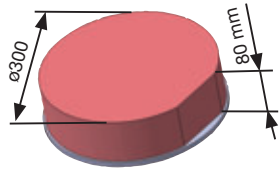
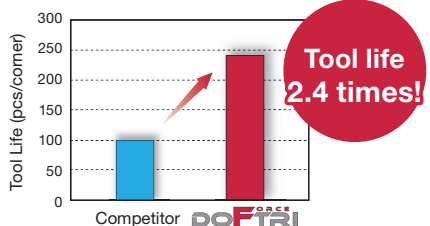
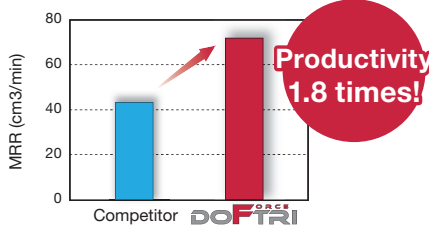
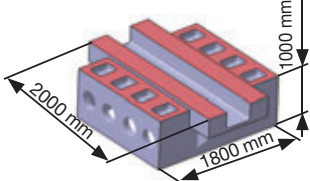
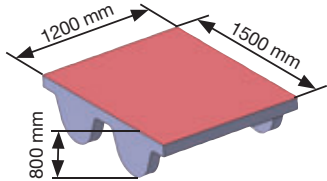
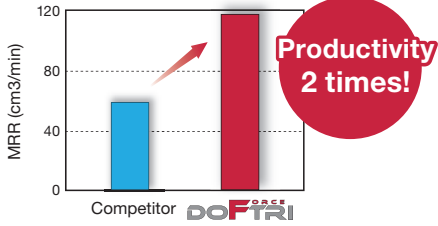
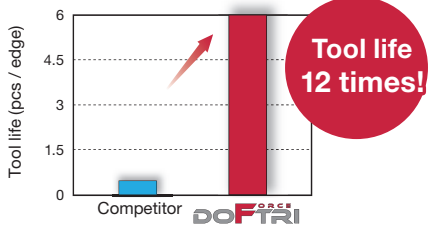
STANDARD CUTTING CONDITIONS

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.)	- 300 HB	First choice	AH3135	MJ	100 - 250	0.08 - 0.3
		- 300 HB	Priority on wear resistance	New T3225	MJ	100 - 300	0.08 - 0.3
		- 300 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	New 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	New 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	New 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 / 250, FC300 / 300, etc.)	150 - 250 HB	First choice	AH120	MJ	140 - 250	0.08 - 0.3
		150 - 250 HB	Priority on wear resistance	New 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 / 600-3, etc.)	150 - 250 HB	First choice	AH120	MJ	110 - 200	0.08 - 0.25
		150 - 250 HB	Priority on wear resistance	New 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	AH120	MJ	20 - 60	0.08 - 0.2
		-	For low cutting force	AH120	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 the feed rate less than 0.15 mm/z.

Designation	Chip thickness (mm)
TNMMU120708PER-NMJ	0.2
TNGU120708PER-NMJ	0.15

PRACTICAL EXAMPLES

Workpiece type		Carrier	Cylinder
Cutter		TPN12R063M22.0E06 ($\phi 63$, $z = 6$)	TPTN12J100B31.7R10 ($\phi 50$, $z = 5$)
Insert		TNGU120708PER-MJ	TNGU120708PER-MJ
Grade		AH120	AH3135
Workpiece material		Pearlitic cast iron (250 HB)	S45C / C45
Cutting conditions			
Cutting conditions	Cutting speed: V_c (m/min)	150	180
	Feed per tooth: f_z (mm/t)	0.2	0.14
	Feed speed: V_f (m/min)	950	800
	Depth of cut: a_p (mm)	6	3
	Width of cut: a_e (mm)	20	30
	Method of machining	Face milling	Face milling, Shoulder milling
	Coolant	Wet	Air
Machine		Horizontal M/C, BT50	Vertical M/C, BT40
Results		 The combination of special geometing and grade for inserts in DoForce-Tri series helps extend tool life compared to the competitor.	 Optimized geometing of the DoForce-Tri insert reduces cutting force and allows more inserts to be used on a single cutter body, which improves productivity.
Workpiece type		Machine base	Plate
Cutter		TPTN12J100B31.7R10 ($\phi 100$, $z = 10$)	TPTN12J100B31.7R07 ($\phi 100$, $z = 7$)
Insert		TNMU120708PER-MJ	TNGU120708PER-NMJ
Grade		AH120	AH3135
Workpiece material		FCD450 / 450-10S / GGG45	SM400A
Cutting conditions			
Cutting conditions	Cutting speed: V_c (m/min)	200	160
	Feed per tooth: f_z (mm/t)	0.2	0.1
	Feed speed: V_f (m/min)	890	400
	Depth of cut: a_p (mm)	2	4
	Width of cut: a_e (mm)	70	60
	Method of machining	Face milling	Face milling
	Coolant	Wet	Dry
Machine		Horizontal M/C, BT50	Vertical M/C, BT50
Results		 DoForce-Tri's free-cutting inserts reduced vibration at a high speed and doubled the metal removal rate.	 NMJ, the serrated insert, in optimal grade improves tool life by 6 times.

100

Abstract

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