

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





ACCELERATED MACHINING

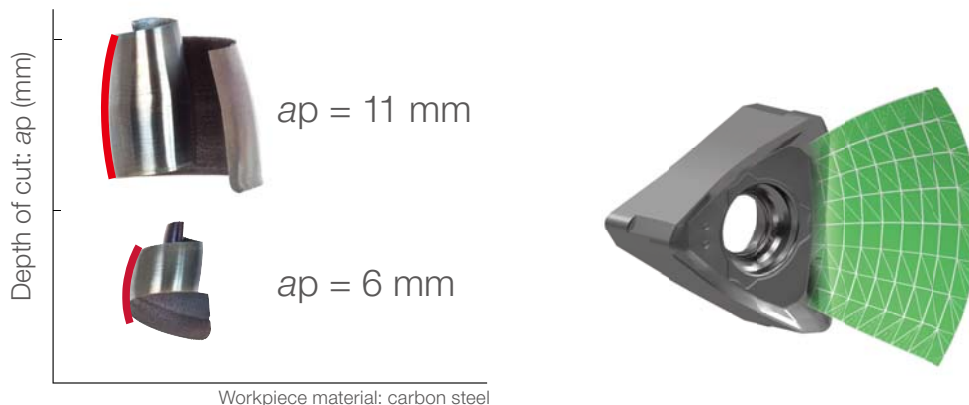
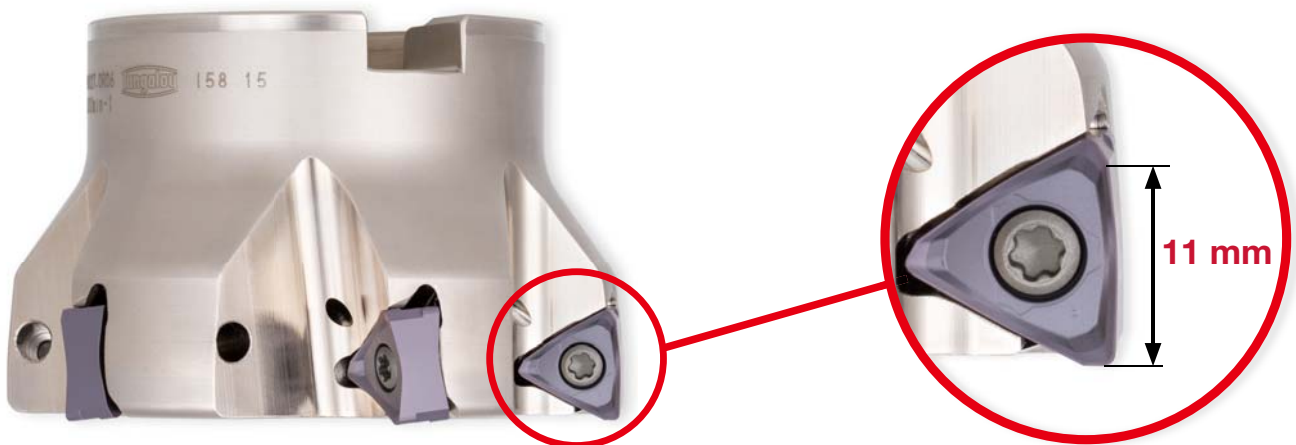


DoForce-Tri is a new series of tools with double-sided triangular insert performing **general milling applications with superior advantages.**

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



- 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.



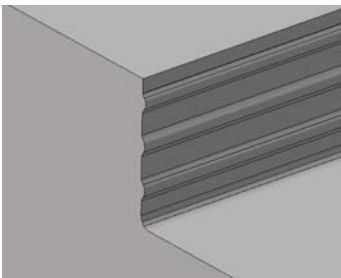
- Insert with round corner for high toughness
- Large rake angle reduces cutting force.
- Insert shape suitable for both R- & L-hand* cutter bodies
(*: Left-hand body will be available upon request.)



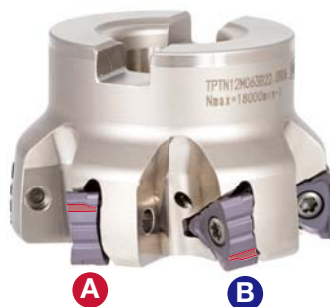
- Grooves on the cutting edge create small chips, reducing cutting force and chip volume.
- Eliminates vibration on long-overhang tool
- Suitable for large depth of cut in face milling
- Each insert has asymmetrical groove on the cutting edge of side-A and side-B to achieve good wall surface quality*.

*: Side-A & side-B must be placed alternately in adjacent pockets.

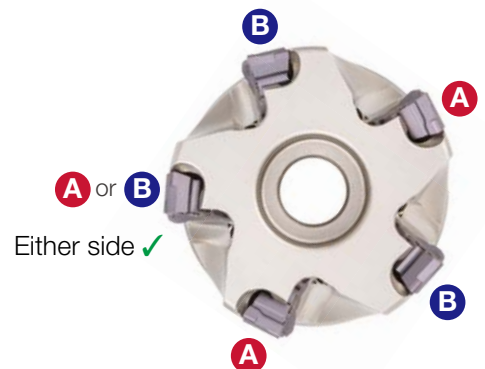
Note: Side A and Side B can be identified by the tapering groove shape and its position in the pocket as highlighted below by red colour.



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



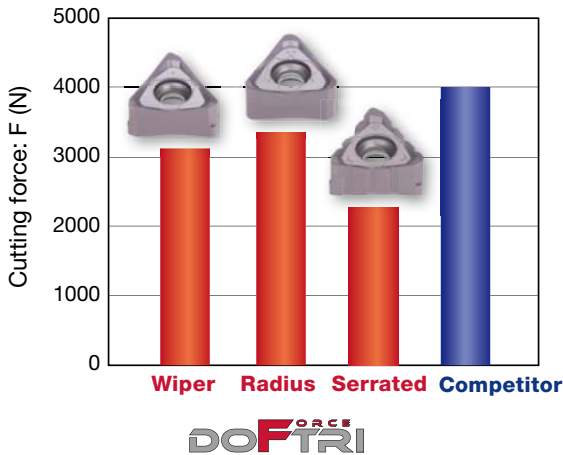
Asymmetrical groove on sides A & B



Insert positioning for the cutter with pockets in odd number

CUTTING PERFORMANCE

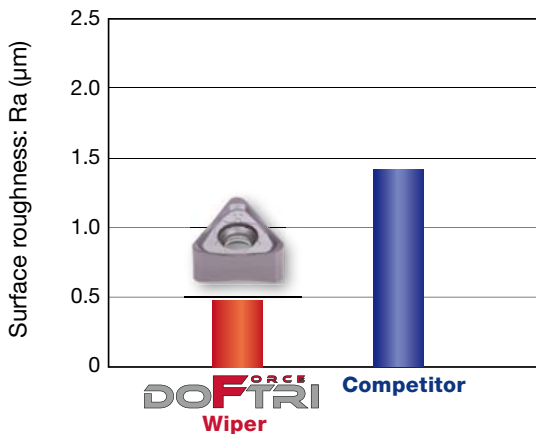
Cutting force



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.

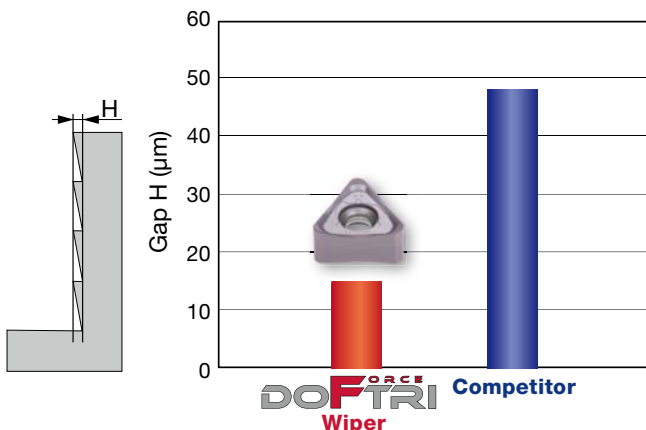
Surface roughness



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.

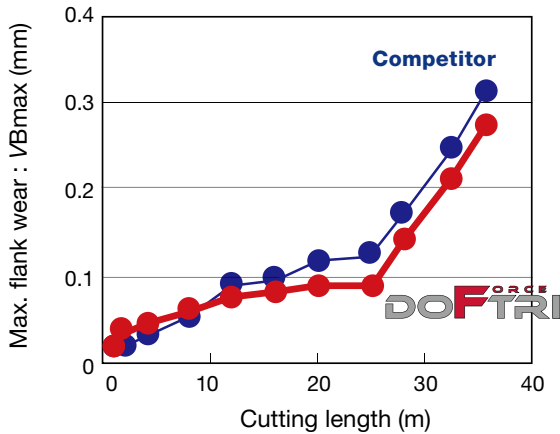
Wall accuracy



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

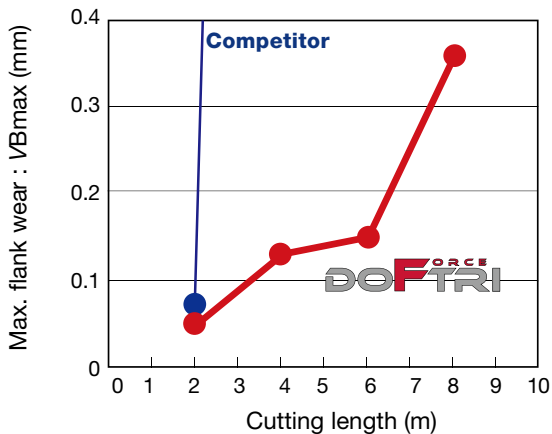
Optimized cutting edge geometry provides high wall accuracy.

Tool life in machining steel



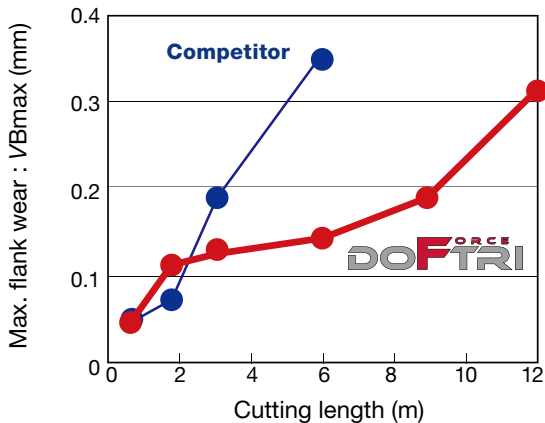
Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNGU120708PER-MJ / AH3135
 Workpiece material: S55C / C55
 Cutting speed : $V_c = 150$ m/min
 Feed per tooth : $f_z = 0.15$ mm/t
 Depth of cut : $a_p = 5$ mm
 Width of cut : $a_e = 30$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50, 30kW

Tool life in machining stainless steel



Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNGU120708PER-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, 30kW

Tool life in machining cast iron

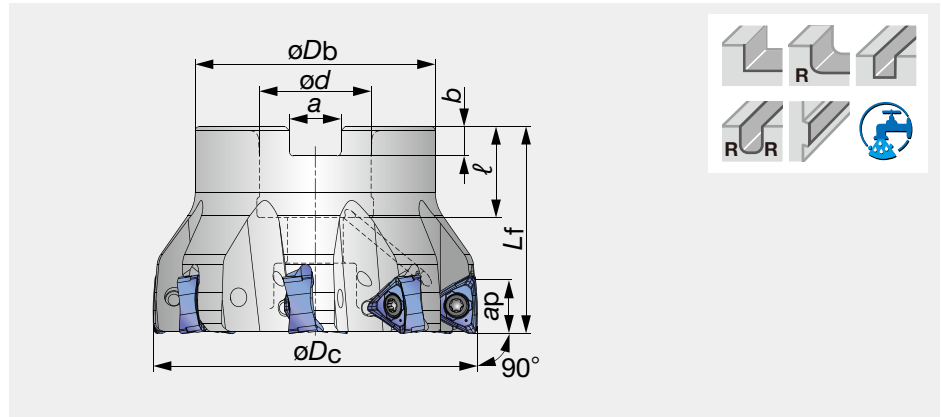


Cutter : TPTN12M050B22.0R05 ($\phi D_c = 50$ mm, $z = 1$)
 Insert : TNGU120708PER-MJ / AH120
 Workpiece material: FC250 / 250
 Cutting speed : $V_c = 200$ m/min
 Feed per tooth : $f_z = 0.2$ mm/t
 Depth of cut : $a_p = 5$ mm
 Width of cut : $a_e = 34$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT50, 30kW

Square shoulder milling cutters with double-sided triangular insert

CUTTER - BORE TYPE

DoForce-Tri TPTN12



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

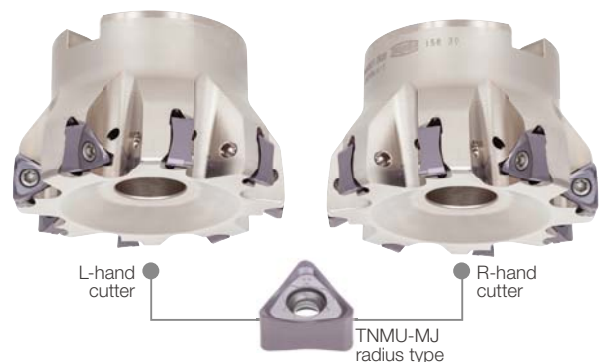
*Torque: Recommended torque (N·m) for clamping

SPARE PARTS



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

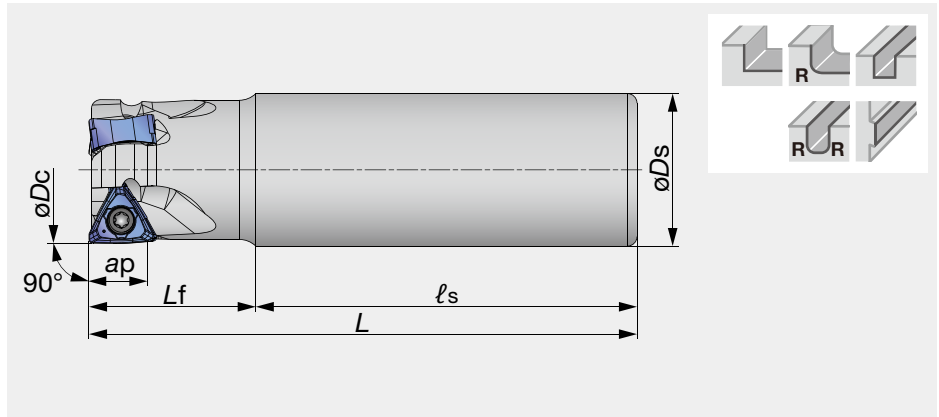
Left-hand body will be available upon request - can be used only with TNMU-MJ insert



Square shoulder milling cutters with double-sided triangular insert

CUTTER - SHANK TYPE

DoForce-Tri EPTN12



Designation	Max. ap	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

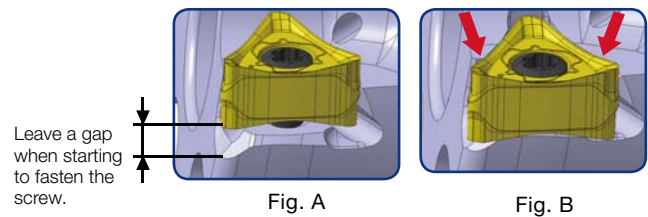
SPARE PARTS



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)



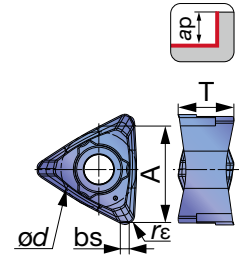
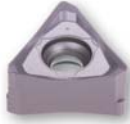
INSERT

TNMU-MJ

TNGU-MJ

TNGU-NMJ

TNMU-R-MJ



Designation	Max. ap	A	ød	T	rε	bs	AH3135	AH120	T1215	T3225
TNMU120708PER-MJ	11	12.0	9.525	7.04	0.80	1.16	● ● ● ● ○	○ ● ● ● ●	● ● ● ● ●	● ● ● ● ●
TNGU120708PER-MJ	11	12.0	9.525	7.04	0.80	1.16	● ● ● ● ○	○ ● ● ● ●	● ● ● ● ●	● ● ● ● ●
TNGU120708PER-NMJ *	11	12.0	9.525	7.04	0.80	1.16	● ● ● ● ○	○ ● ● ● ●	● ● ● ● ●	● ● ● ● ●
TNMU1207R16PER-MJ	11	12.0	9.525	7.04	1.60	-	● ● ● ● ○	○ ● ● ● ●	● ● ● ● ●	● ● ● ● ●

*Neutral shape for both R-hand & L-hand cutter bodies.

● First choice

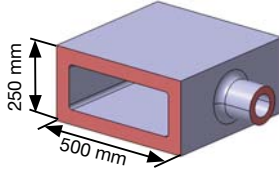
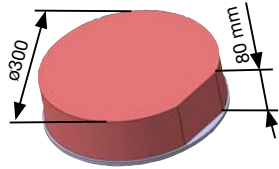
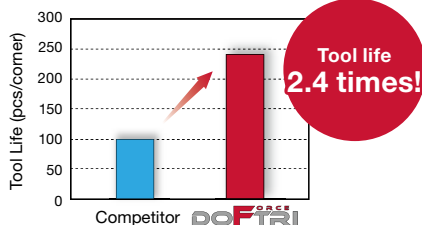
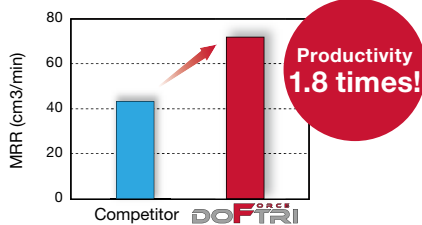
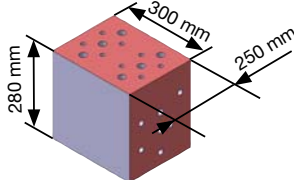
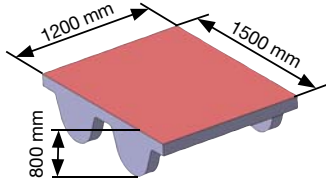
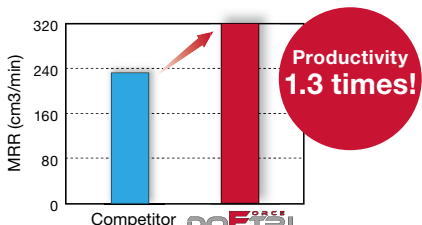
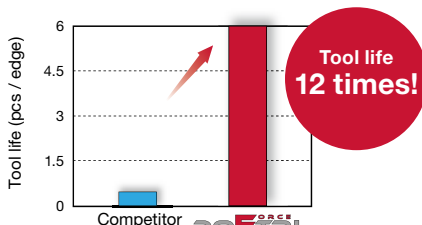
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STANDARD CUTTING CONDITIONS

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	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	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 / 250, FC300 / 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 / 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	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: When you use the NMJ chipbreaker, please set up the feed less than 0.15 mm/t.

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)  K	 P
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	 <p>The combination of special geometing and grade for inserts in DoForce-Tri series helps extend tool life compared to the competitor.</p>		 <p>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.</p>
Workpiece type		Manifold	Plate
Cutter		TPTN12J100B31.7R10 ($\phi 100$, z = 10)	TPTN12J100B31.7R07 ($\phi 100$, z = 7)
Insert		TNGU120708PER-MJ	TNGU120708PER-NMJ
Grade		AH120	AH3135
Workpiece material		FCD450  K	 P
Cutting conditions	Cutting speed: V_c (m/min)	150	160
	Feed per tooth: f_z (mm/t)	0.26	0.1
	Feed speed: V_f (m/min)	1250	400
	Depth of cut: a_p (mm)	4 (competitor: $a_p = 3$)	4
	Width of cut: a_e (mm)	80	60
	Method of machining	Face milling	Face milling
Coolant	Air	Dry	
Machine	Horizontal M/C, BT50	Vertical M/C, BT50	
Results	 <p>Low cutting force with DoForce-Tri allows large depth of cut to be machined, improving productivity.</p>		 <p>NMJ, the serrated insert, in optimal grade improves tool life by 6 times.</p>

Tungaloy Corporation (Head office)

11-1 Yoshima-Kogyodanchi
Iwaki-city, Fukushima, 970-1144 Japan
Phone: +81-246-36-8501
Fax: +81-246-36-8542
www.tungaloy.co.jp

Tungaloy America, Inc.

3726 N Ventura Drive
Arlington Heights, IL 60004, U.S.A.
Phone: +1-888-554-8394
Fax: +1-888-554-8392
www.tungaloyamerica.com

Tungaloy Canada

432 Elgin St. Unit 3
Brantford, Ontario N3S 7P7, Canada
Phone: +1-519-758-5779
Fax: +1-519-758-5791
www.tungaloy.co.jp/ca

Tungaloy de Mexico S.A.

C Los Arellano 113,
Parque Industrial Siglo XXI,
Aguascalientes, AGS, Mexico 20290
Phone: +52-449-929-5410
Fax: +52-449-929-5411
www.tungaloy.co.jp/mx

Tungaloy do Brasil Ltda.

Avd. Independencia N4158 Residencial Flora
13280-000 Vinhedo, São Paulo, Brasil
Phone: +55-19-38262757
Fax: +55-19-38262757
www.tungaloy.com/br

Tungaloy Germany GmbH

An der Alten Ziegelei 1
D-40789 Monheim, Germany
Phone: +49-2173-90420-0
Fax: +49-2173-90420-19
www.tungaloy.de

Tungaloy France S.A.S.

ZA Courtaboeuf - Le Rio
1 rue de la Terre de feu
F-91952 Courtaboeuf Cedex, France
Phone: +33-1-6486-4300
Fax: +33-1-6907-7817
www.tungaloy.fr

Tungaloy Italia S.r.l.

Via E. Andolfato 10
I-20126 Milano, Italy
Phone: +39-02-252012-1
Fax: +39-02-252012-65
www.tungaloy.it

Tungaloy Czech s.r.o.

Turanka 115
CZ-627 00 Brno, Czech Republic
Phone: +420-532 123 391
Fax: +420-532 123 392
www.tungaloy.cz

Tungaloy Ibérica S.L.

C/Miquel Servet, 43B, Nau 7
Pol. Ind. Bufalvent
ES-08243 Manresa (BCN), Spain
Phone: +34 93 113 1360
Fax: +34 93 876 2798
www.tungaloy.es

Tungaloy Scandinavia AB

Bultgatan 38
442 40 Kungälv, Sweden
Phone: +46-462119200
www.tungaloy.se

Tungaloy Rus, LLC

36-D Harkovsky Lane
308009 Belgorod, Russia
Phone: +7 4722 24 00 07
Fax: +7 4722 24 00 08
www.tungaloy.co.jp/ru

Tungaloy East LLC

Stachek str., h.4, office 2, Ekaterinburg,
620017, Russia
Phone: +7-343-389-13-22
Fax: +7-343-278-94-35
www.tungaloy.co.jp/rue

Tungaloy Polska Sp. z o.o.

ul. Genewska 24
03-963 Warszawa, Poland
Phone: +48-22-617-0890
Fax: +48-22-617-0890
www.tungaloy.co.jp/pl

Tungaloy U.K. Ltd

The Technology Centre,
Wolverhampton Science Park
Glaisher Drive, Wolverhampton
West Midlands WV10 9RU, UK
Phone: +44 121 4000 231
Fax: +44 121 270 9694
www.tungaloy.co.jp/uk
salesinfo@tungaloyuk.co.uk

Tungaloy Hungary Kft

Erzsébet királyné útja 125
H-1142 Budapest, Hungary
Phone: +36 1 781-6846
Fax: +36 1 781-6866
www.tungaloy.co.jp/hu
info@tungaloytools.hu

Tungaloy Turkey

Dudullu.OSB 4. Cad No:4
34776 Umraniye Istanbul, TURKEY
Phone: +90 216 540 04 67
Fax: +90 216 540 04 87
www.tungaloy.com.tr
info@tungaloy.com.tr

Tungaloy Benelux b.v.

Tjalk 70
NL-2411 NZ Bodegraven, Netherlands
Phone: +31 172 630 420
Fax: +31 172 630 429
www.tungaloy-benelux.com

Tungaloy Croatia

Josipa Kozarca 4
10432 Bregana, Croatia
Phone: +385 1 3326 604
Fax: +385 1 3327 683
www.tungaloy.hr

Tungaloy Cutting Tool (Shanghai) Co.,Ltd.

Rm No 401 No.88 Zhabei
Jiangchang No.3 Rd
Shanghai 200436, China
Phone: +86-21-3632-1880
Fax: +86-21-3621-1918
www.tungaloy.co.jp/tcts

Tungaloy Cutting Tool (Thailand) Co.,Ltd.

Interlink tower 4th Fl.
1858/5-7 Bangna-Trad Road
km.5 Bangna, Bangna, Bangkok 10260
Thailand
Phone: +66-2-751-5711
Fax: +66-2-751-5715
www.tungaloy.co.th

Tungaloy Singapore (Pte.), Ltd.

62 Ubi Road 1, #06-11 Oxley BizHub 2
Singapore 408734
Phone: +65-6391-1833
Fax: +65-6299-4557
www.tungaloy.co.jp/tspl

Tungaloy Vietnam

Unit 18, 4th Fl. Saigon Centre Building
65 Le Loi Blvd.
Dist 1, Ho Chi Minh City, Vietnam
Phone: +84-8-3827-0201
Fax: +84-8-3827-0203
www.tungaloy.co.jp/tspl

Tungaloy India Pvt. Ltd.

Indiabulls Finance Centre,
Unit # 902-A, 9th Floor,
Tower 1, Senapati Bapat Marg,
Elphinstone Road (West),
Mumbai-400013, India
Phone: +91-22-6124-8804
Fax: +91-22-6124-8899
www.tungaloy.co.jp/in

Tungaloy Korea Co., Ltd

#1312, Byucksan Digital Valley 5-cha
Beotkkot-ro 244, Geumcheon-gu
153-788 Seoul, Korea
Phone: +82-2-2621-6161
Fax: +82-2-6393-8952
www.tungaloy.co.jp/kr

Tungaloy Malaysia Sdn Bhd

50 K-2, Kelana Mall, Jalan SS6/14
Kelana Jaya, 47301
Petaling Jaya, Selangor Darul Ehsan
Malaysia
Phone: +603-7805-3222
Fax: +603-7804-8563
www.tungaloy.com.my

Tungaloy Australia Pty Ltd

PO Box 2232, Rowville,
Victoria 3178, Australia
Phone: +61-3-9755-8147
Fax: +61-3-9755-6070
www.tungaloy.com.au

PT. Tungaloy Indonesia

Kompleks Grand Wisata Block AA-10 No.3-5
Cibitung
Bekasi 17510, Indonesia
Phone: +62-21-8261-5808
Fax: +62-21-8261-5809
www.tungaloy.co.jp/id



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