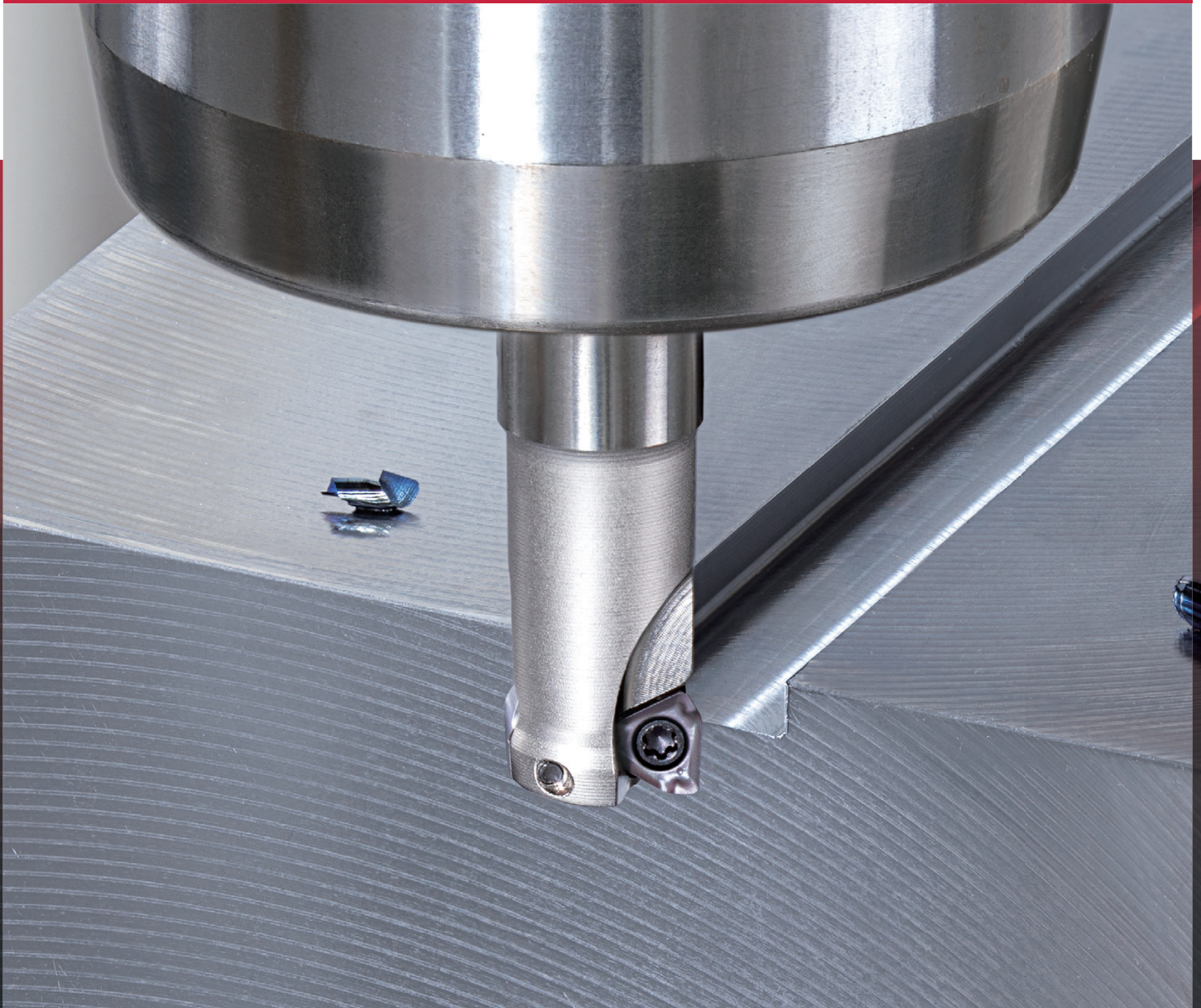


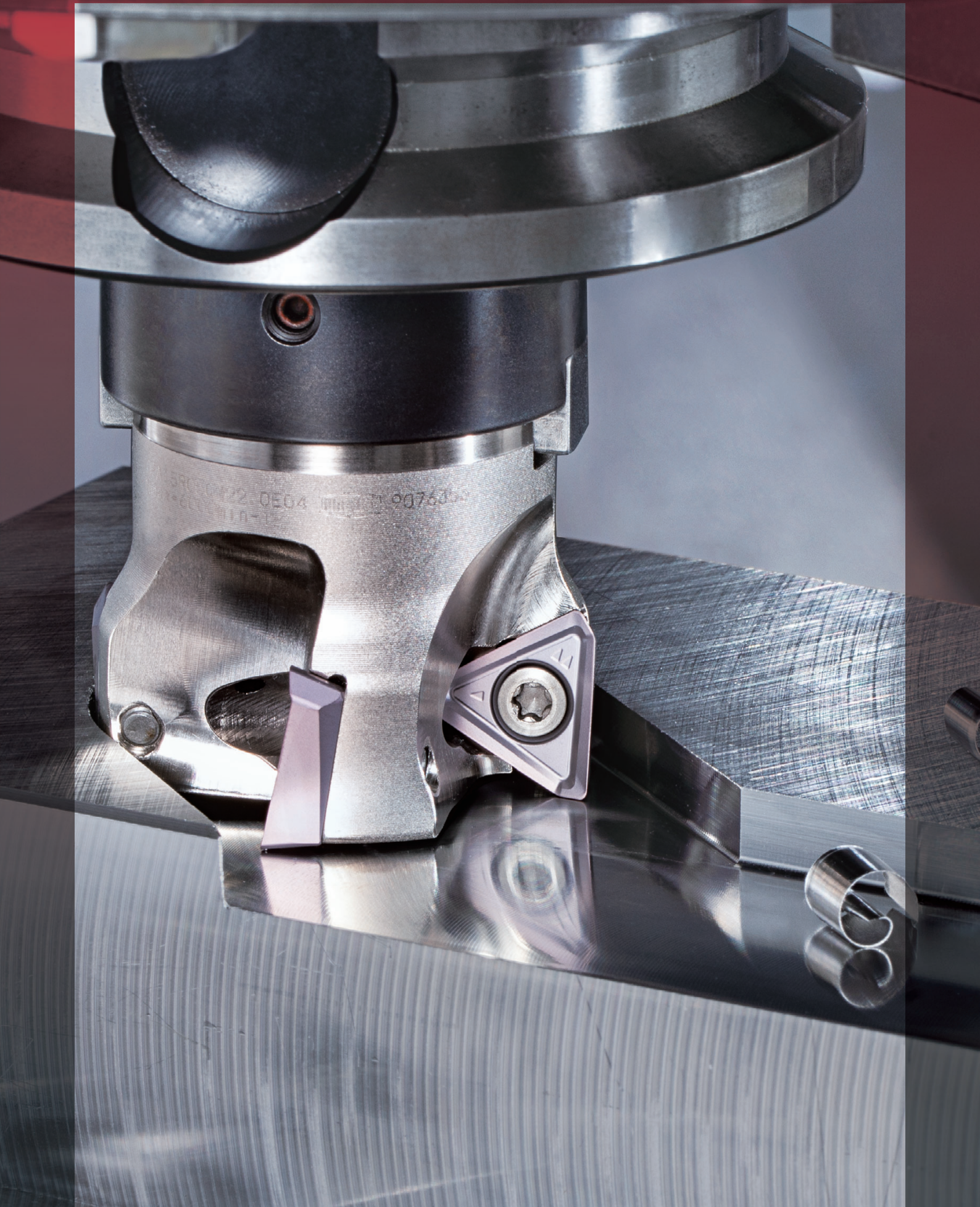
Shoulder milling cutter

**TUNG-TRI**

Tungaloy Report No. 421-G

Economical shoulder milling cutter with  
3 cutting edged insert with wide range of  
sizes, grades and diameters





**INDUSTRY 4.0**  
*FEED the SPEED!*



# TUNG-TRI

---



Complete solution for shoulder milling with outstanding performance and cost-effective inserts

## Shoulder milling from $\varnothing 8$ up to $\varnothing 160$ mm

### Four insert sizes

APMX = Max. depth of cut



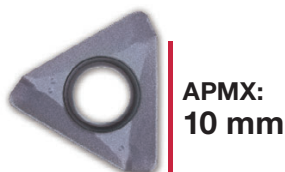
Insert size 04

$\varnothing 8 - \varnothing 25$  mm



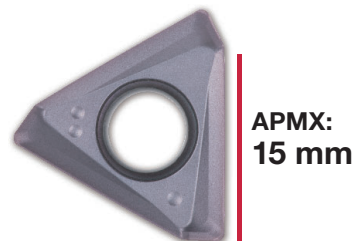
Insert size 06

$\varnothing 12 - \varnothing 50$  mm



Insert size 10

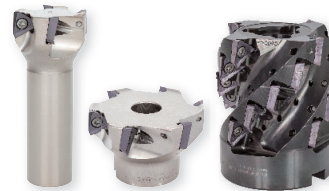
$\varnothing 25 - \varnothing 100$  mm



Insert size 15

$\varnothing 40 - \varnothing 160$  mm

Toolholder adaptation



### Tool diameters and number of teeth for each insert size

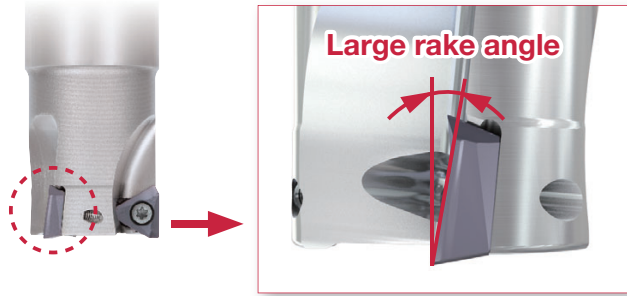
Insert size	Max. depth of cut (mm)	Corner radius (mm)	Workpiece material	Tool diameter (mm), Number of teeth																	
				$\varnothing 8$	$\varnothing 10$	$\varnothing 12$	$\varnothing 16$	$\varnothing 18$	$\varnothing 20$	$\varnothing 22$	$\varnothing 25$	$\varnothing 28$	$\varnothing 32$	$\varnothing 35$	$\varnothing 40$	$\varnothing 50$	$\varnothing 63$	$\varnothing 80$	$\varnothing 100$	$\varnothing 125$	$\varnothing 160$
04	3.5	0.4 0.8	P M K S H	1	2	3 2	4 3		5 4		6 5 4										
06	6	0.2 0.4 0.8	P M K N S H			1	2	2	3 2	3 2	4 3 2	4 3 2	5		6	8					
10	10	0.4 0.8 1.6	P M K N S H								2	2	3 2	3 2	4 3 2	4	6	7	8		
15	15	0.4 0.8 1.6 2	P M K N S H												3 2	4 2	5	6	7	8	10

See page 9 for roughing type.

## ■ 3 cutting-edged insert provides economical solution with low cutting forces



Helical cutting edge provides low cutting forces in all applications



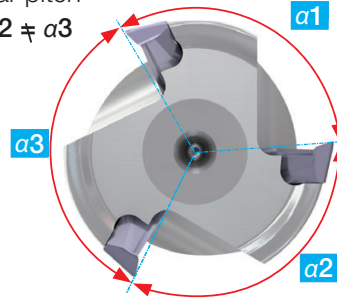
## ■ Applicable for a wide range of cutting conditions

A combination of inserts with multi-angled side clearance and irregular-pitched insert arrangements eliminates chatter generation during machining



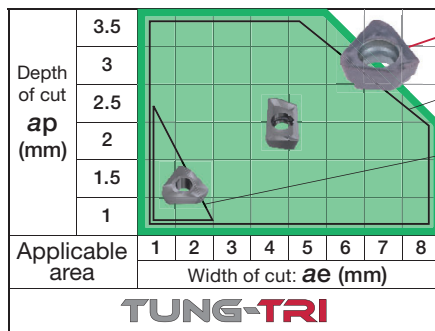
Uniquely designed flank face prevents chipping and chattering

Irregular pitch  
 $\alpha_1 \neq \alpha_2 \neq \alpha_3$



## ■ Cutting performance

Insert size 04  $\phi 10$  mm



**TUNG-TRI**

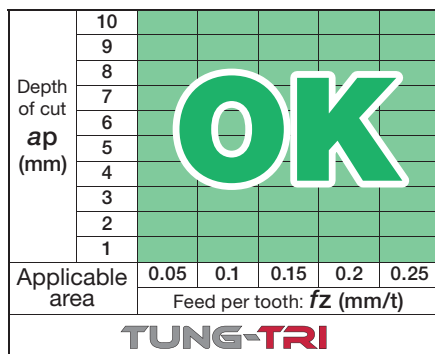
Competitor's insert (with 2 cutting edges)

Competitor's insert (with 3 cutting edges)

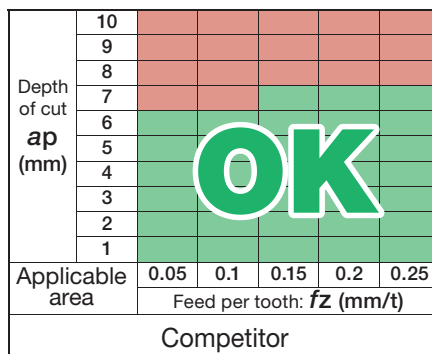
Cutter : EPA04R010M10.0-02  
( $\phi 10$  mm,  $z = 2$ )  
Insert : TOMT040204PXER-MM  
Grade : AH3225  
Workpiece : S55C / C55  
Cutting speed :  $V_c = 200$  m/min

Feed per tooth :  $f_z = 0.07$  mm/t  
Coolant : Air blast  
Overhang length : 20 mm  
Machine : Vertical M/C, HSK63A  
Criteria : Chattering

Insert size 10  $\phi 32$  mm



OK Chatter



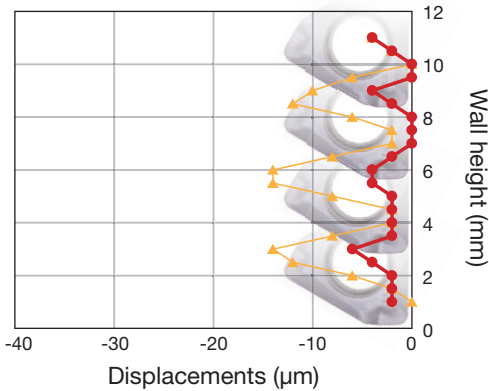
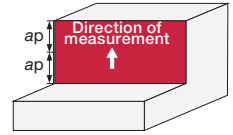
Cutter : EPA10R032M32.0-03N  
( $\phi 32$  mm,  $z = 3$ )  
Insert : TOMT100404PDER-MJ  
Grade : AH3135  
Workpiece : S55C / C55 (200 HB)  
Cutting speed :  $V_c = 150$  m/min  
Width of cut :  $a_e = 32$  mm  
Machine : Vertical M/C, BT50  
Criteria : Chattering

## Excellent wall accuracy

High wall accuracy due to helical cutting edge with low cutting force

### Wall accuracy

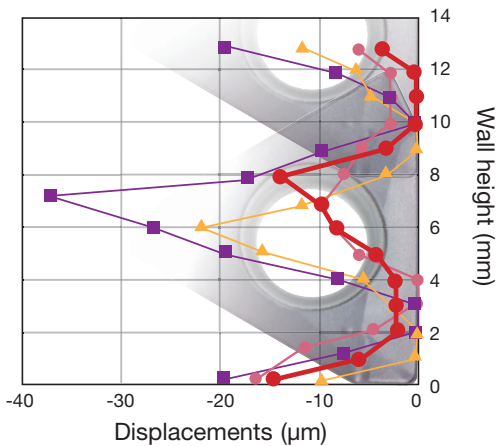
Insert size 04  $\phi 10$  mm



**P** Cutter : EPA04R010M10.0-02 ( $\phi 10$  mm, z = 2)  
 Insert : TOMT040204PXER-MM  
 Grade : AH3225  
 Workpiece : S55C / C55  
 Cutting speed :  $V_c = 200$  m/min  
 Feed per tooth :  $f_z = 0.07$  mm/t  
 Depth of cut :  $a_p = 3$  mm x 4 passes  
 Width of cut :  $a_e = 0.5$  mm  
 Coolant : Air blast  
 Overhang length : 20 mm  
 Machine : Vertical M/C, HSK63A

—●— TUNG-TRI  
 —▲— Competitor's insert  
 (with 2 cutting edges)

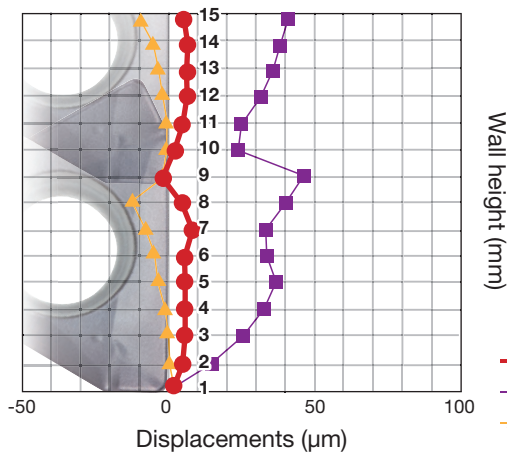
Insert size 10  $\phi 32$  mm



**P** Cutter : EPA10R032M32.0-03N ( $\phi 32$  mm, z = 3)  
 Insert : TOMT100404PDER-MJ  
 Grade : AH3135  
 Workpiece : S55C / C55 (200HB)  
 Cutting speed :  $V_c = 150$  m/min  
 Feed per tooth :  $f_z = 0.1$  mm/t  
 Depth of cut :  $a_p = 8$  mm x 2 passes  
 Width of cut :  $a_e = 5$  mm  
 Machine : Vertical M/C, BT50

—●— TUNG-TRI  
 —●— Conventional  
 —■— Competitor A  
 —▲— Competitor B

Insert size 10  $\phi 32$  mm











**N** Cutter : EPA10R032M32.0-03N ( $\phi 32$  mm, z = 3)  
 Insert : TOGT100408PDFR-AJ  
 Grade : KS05F  
 Workpiece : A7075 (Alumigo Hard)  
 Cutting speed :  $V_c = 900$  m/min  
 Feed per tooth :  $f_z = 0.1$  mm/t  
 Depth of cut :  $a_p = 8$  mm x 2 passes  
 Width of cut :  $a_e = 5$  mm  
 Coolant : External air  
 Machine : Vertical M/C, HSK63A

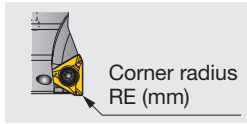
—●— TUNG-TRI  
 —■— Competitor A  
 —▲— Competitor B

# Various chipbreaker geometries

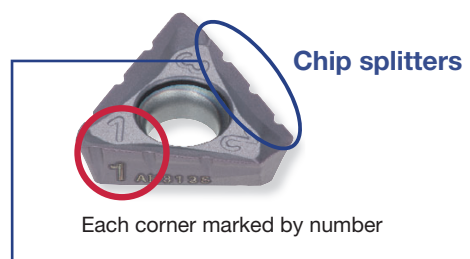
First-choice chipbreakers

Insert size	MM / MJ	NMJ	AJ
04	 RE: 0.4 - 0.8	-	-
06	 RE: 0.2 - 0.8	-	 RE: 0.4 - 0.8
10	 RE: 0.4 - 1.6	-	 RE: 0.4 - 0.8 (- 1.6*)
15	 RE: 0.4 - 2.0	 RE: 0.8	 RE: 0.4 - 0.8 (- 2.0*)

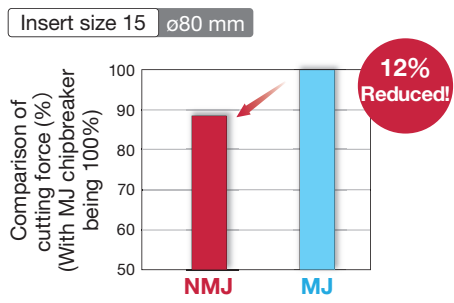
\* Available upon request



## Chip splitter for breaking chips in small pieces NMJ chipbreaker (insert size 15)



- 10% reduction in cutting force compared to MJ chipbreaker due to split chips
- Suitable for machining with large width of cut due to split chips

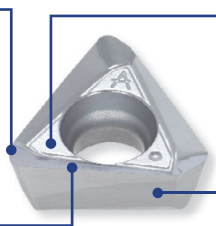


**P** Cutter : TPA15R080M25.4-06 (ø80 mm, z = 6)  
 Insert : TOMT150608PDER-NMJ, TOMT150608PDER-MJ  
 Grade : AH3135  
 Workpiece : SCM440 / 42CrMo4 (200HB)  
 Cutting speed :  $V_c = 100$  m/min  
 Feed per tooth :  $f_z = 0.1$  mm/t  
 Depth of cut :  $a_p = 13$  mm  
 Width of cut :  $a_e = 29$  mm  
 Coolant : Air blast  
 Machine : Vertical M/C, BT50

## AJ chipbreaker (insert size 06, 10, 15) for non-ferrous applications

**Wiper edge specifically designed for aluminium machining**  
 Provides excellent surface finish by directing chips away from the machined surface

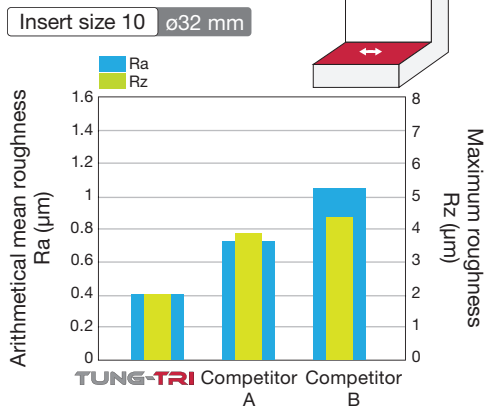
**Cutting edge with large rake angle and high inclination**  
 Low cutting force and smooth machining



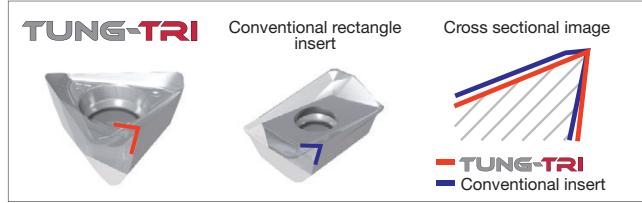
**Lapping treatment**  
 Prevents welding on the cutting edge

**Unique side clearance design**  
 Optimized clearance geometry to enhance insert robustness and vibration damping for machining aluminium

### Surface roughness



### Cross sectional comparison of cutting edge shapes



**N** Cutter : EPA10R032M32.0-03N (ø32 mm, z = 3)  
 Insert : TOGT100408PDFR-AJ  
 Grade : KS05F  
 Workpiece : A7075 (Alumigo Hard)  
 Cutting speed :  $V_c = 900$  m/min  
 Feed per tooth :  $f_z = 0.1$  mm/t  
 Depth of cut :  $a_p = 2$  mm  
 Width of cut :  $a_e = 21$  mm  
 Coolant : External air  
 Machine : Vertical M/C, HSK63A

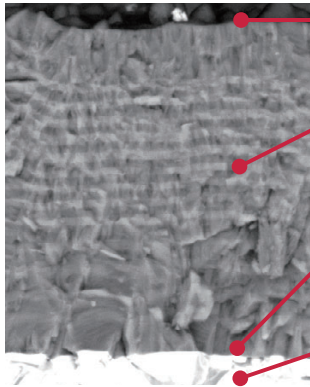
## ■ Addition of AH3225 grade for enhanced insert grade lineup!

Offering four PVD grades, two CVD grades, and one uncoated carbide grade

**New**

### AH3225 P M S

- Nano multi-layer coating technology with three major properties for optimal cutting edge integrity
- Increased resistance to wear, fracture, oxidation, built-up edge, and delamination



#### Resistance to built-up edge

The coating surface prevents built-up edge

#### Resistance to wear, oxidation, and fracture

Multi-layered coating is designed to resist wear and oxidation, while preventing micro-cracks from propagating in the coating layer for improved resistance to edge chipping

#### Strong coating / substrate adhesion

Coating is optimized for strong adhesion property with substrate to maintain strong cutting edge integrity

#### Carbide substrate

High resistance to fracture

## PREMIUMTEC

### AH3135 P M

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

### AH120 P K

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

### AH8015 H S

- Incorporates a hard coating layer and carbide substrate
- Strong resistance to wear, heat, and built-up edge, ideal for machining hard or difficult materials

### T3225 P M

- CVD grade with high chipping and fracture resistance

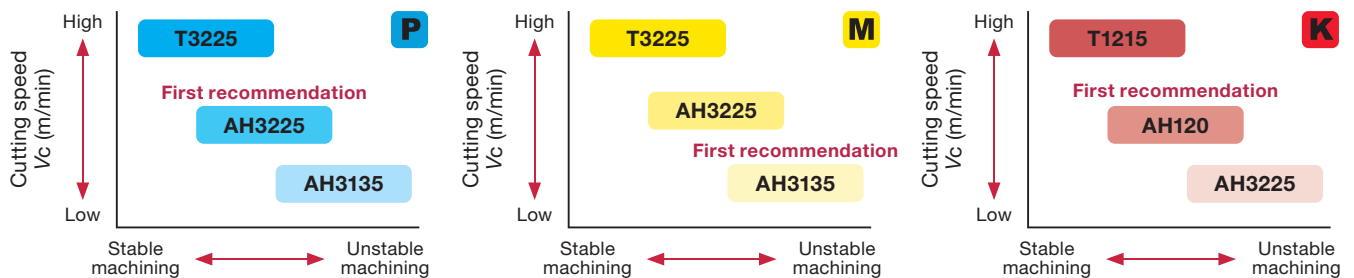
### T1215 K

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

### KS05F N

- Fine-grained cemented carbide grade with high wear resistance
- Extremely sharp edge is suitable for non-ferrous materials

## ■ APPLICATION AREAS





## Roughing type

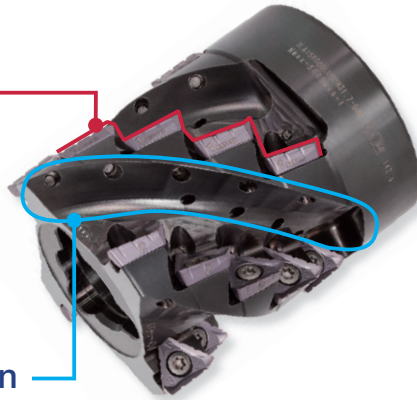
Insert size 10    Insert size 15

### Excellent chattering resistance

- Ideal insert positioning in high helix angle
- Irregular pitch

### Smooth chip evacuation

- Big chip gullet for large width of cut



### Tool diameter and max d.o.c.

Tool dia. (mm)	Max. depth of cut (mm)			
	For TLA10	For TLA15	For TLA15 + BT50 integrated	For TLA15 + PSC integrated
ø50	54 ZEFP = 4			
ø63	54 ZEFP = 4			55 ZEFP = 3
ø80		70 - 126* ZEFP = 4	83 - 139* ZEFP = 4	70 ZEFP = 4
ø100		83 - 139* ZEFP = 5	97 - 153* ZEFP = 5	

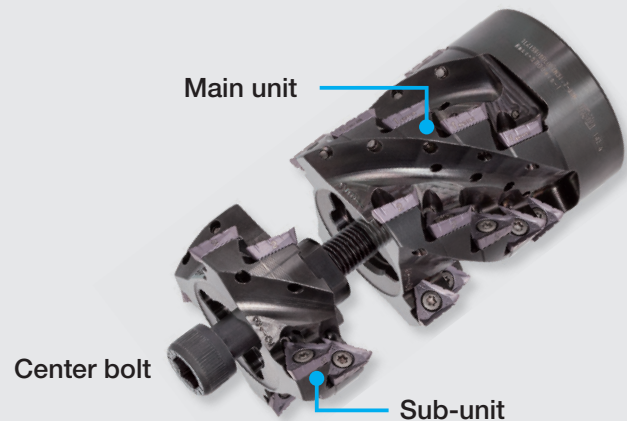
\* Extended with two sub-units  
ZEFP = Number of effective cutting edges on periphery

## Main and sub-unit system (TLA15 type)\*

Insert size 15

- **Exchangeable sub-units**  
(A main unit can be used without the sub-unit.)
- **Adjustable cutting length**  
Maximum depth of cut can be increased  
(Up to 2 sub-units can be added on a main unit to increase depth of cut.)

\* Excluding C-TLA line (integrated with PSC connection)



## Comparison of application areas

- Strong resistance to chattering and low cutting force cover a wide range of applications
- The application range is remarkably expanded with NMJ chipbreaker

## Cutting performance

Insert size 15    ø80 mm

ae (mm)	ae / øDc (mm)	with NMJ chipbreaker				Competitor					
		0.05	0.1	0.15	0.2	0.05	0.1	0.15	0.2		
30	38%	OK				Chatter					
20	25%	OK				Chatter					
10	13%	OK				OK					
Width of cut		Feed per tooth: fz (mm/t)				Width of cut		Feed per tooth: fz (mm/t)			
<b>TUNG-TRI</b>						Competitor					

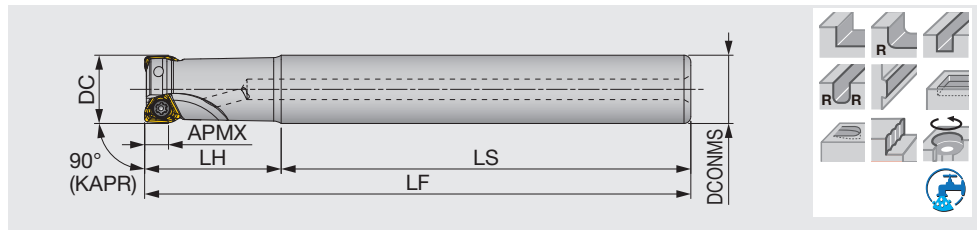
Cutter : TLA15R080L070M31.7-04M  
(ø80 mm, ZEFP = 4)  
Insert : TOMT150608PDER-NMJ,  
TOMT150608PDER-MJ  
Grade : AH3135  
Workpiece : SCM440 / 42CrMo4 (270HB)

Cutting speed : Vc = 100 m/min  
Depth of cut : ap = 55 mm  
Coolant : Dry  
Machine : Vertical M/C, BT50  
Criteria : Chattering

## EPA04

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +12.1°~ +12.2°, GAMF = -14.2°~ -18.3°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA04R008M08.0-01	3.5	8	1	8	48	12	60	0.02	with	TOMT04...
EPA04R010M10.0-02	3.5	10	2	10	60	20	80	0.04	with	TOMT04...
EPA04R010M10.0-02L	3.5	10	2	10	65	35	100	0.05	with	TOMT04...
EPA04R012M12.0-02	3.5	12	2	12	60	20	80	0.06	with	TOMT04...
EPA04R012M12.0-03	3.5	12	3	12	60	20	80	0.06	with	TOMT04...
EPA04R012M12.0-02L	3.5	12	2	12	85	35	120	0.09	with	TOMT04...
EPA04R016M16.0-03	3.5	16	3	16	70	20	90	0.12	with	TOMT04...
EPA04R016M16.0-04	3.5	16	4	16	70	20	90	0.12	with	TOMT04...
EPA04R016M16.0-03L	3.5	16	3	16	105	35	140	0.19	with	TOMT04...
EPA04R020M20.0-04	3.5	20	4	20	70	30	100	0.21	with	TOMT04...
EPA04R020M20.0-05	3.5	20	5	20	70	30	100	0.21	with	TOMT04...
EPA04R020M20.0-04L	3.5	20	4	20	165	35	200	0.44	with	TOMT04...
EPA04R025M25.0-05	3.5	25	5	25	80	35	115	0.39	with	TOMT04...
EPA04R025M25.0-06	3.5	25	6	25	80	35	115	0.39	with	TOMT04...
EPA04R025M25.0-04L	3.5	25	4	25	160	40	200	0.7	with	TOMT04...

### SPARE PARTS



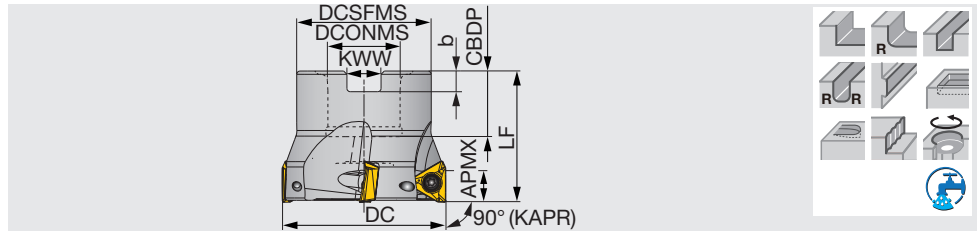
Designation	Clamping screw	Wrench
EPA04R008M08.0-01	CSPB-1.8L3.3	IP-6DB
EPA04R010 - 025...	CSPB-1.8L3.6	IP-6DB

\*Recommended clamping torque (N·m): CSPB-1.8L3.3/CSPB-1.8L3.6 = 0.5

## TPA06

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +8.5° ~ +11.5°, GAMF = -5.5° ~ -12.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA06R032M16.0E05	6	32	5	30	16	18	40	5.6	8.4	0.14	with	TO*T06...
TPA06R040M16.0E06	6	40	6	35	16	18	40	5.6	8.4	0.22	with	TO*T06...
TPA06R050M22.0E08	6	50	8	41	22	20	40	6.3	10.4	0.31	with	TO*T06...

### SPARE PARTS

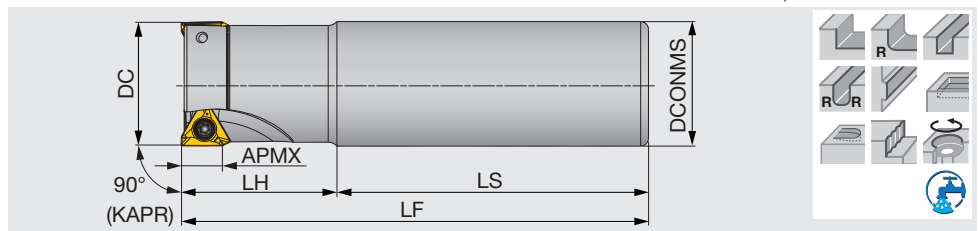
Designation	Clamping screw	Lubricant	Center bolt	Wrench
TPA06R032M16.0E05	CSTB-2.5	M-1000	FSHM8-30H	T-8D
TPA06R040M16.0E06	CSTB-2.5	M-1000	CM8X30H	T-8D
TPA06R050M22.0E08	CSTB-2.5	M-1000	CM10X30H	T-8D

\*Recommended clamping torque (N·m): CSTB-2.5 = 1.3

## EPA06

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +8.5° ~ +11.5°, GAMF = -5.5° ~ -12.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA06R012M16.0-01N	6	12	1	16	50	18	68	0.09	without	TO*T06...
EPA06R016M16.0-02N	6	16	2	16	60	24	84	0.12	without	TO*T06...
EPA06R016M16.0-02L	6	16	2	16	105	40	145	0.2	with	TO*T06...
EPA06R018M16.0-02N	6	18	2	16	60	24	84	0.13	without	TO*T06...
EPA06R018M16.0-02L	6	18	2	16	115	30	145	0.21	with	TO*T06...
EPA06R020M16.0-02N	6	20	2	16	60	30	90	0.14	without	TO*T06...
EPA06R020M20.0-02N	6	20	2	20	70	30	100	0.23	without	TO*T06...
EPA06R020M20.0-03N	6	20	3	20	70	30	100	0.22	without	TO*T06...
EPA06R020M20.0-02L	6	20	2	20	135	50	185	0.41	with	TO*T06...
EPA06R022M20.0-02N	6	22	2	20	70	30	100	0.23	without	TO*T06...
EPA06R022M20.0-03N	6	22	3	20	70	30	100	0.23	without	TO*T06...
EPA06R022M20.0-02L	6	22	2	20	145	40	185	0.42	with	TO*T06...
EPA06R025M25.0-03N	6	25	3	25	80	35	115	0.41	without	TO*T06...
EPA06R025M25.0-04N	6	25	4	25	80	35	115	0.41	without	TO*T06...
EPA06R025M25.0-02L	6	25	2	25	150	70	220	0.78	with	TO*T06...
EPA06R028M25.0-03N	6	28	3	25	80	35	115	0.42	without	TO*T06...
EPA06R028M25.0-04N	6	28	4	25	80	35	115	0.42	without	TO*T06...
EPA06R028M25.0-02L	6	28	2	25	180	40	220	0.8	with	TO*T06...

### SPARE PARTS

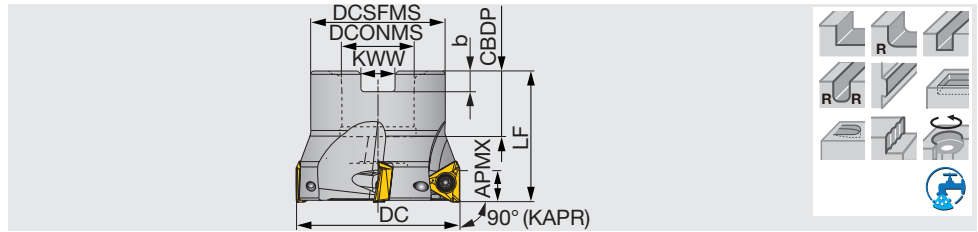
Designation	Clamping screw	Lubricant	Wrench
EPA06R012 - 018M...	CSTB-2.5S	M-1000	T-8D
EPA06R020 - 028M...	CSTB-2.5	M-1000	T-8D

\*Recommended clamping torque (N·m): CSTB-2.5S/CSTB-2.5 = 1.3

## TPA10

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +9.5°~ +11°, GAMF = -4.5°~ -0.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA10R040M16.0E04	10	40	4	35	16	18	40	5.6	8.4	0.2	with	TO*T10...
TPA10R050M22.0E04	10	50	4	41	22	20	40	6.3	10.4	0.31	with	TO*T10...
TPA10R063M22.0E06	10	63	6	41	22	20	40	6.3	10.4	0.51	with	TO*T10...
TPA10R080M25.4-07	10	80	7	58	25.4	26	50	6	9.5	1.04	with	TO*T10...
TPA10R080M27.0E07	10	80	7	58	27	22	50	7	12.4	1.04	with	TO*T10...
TPA10R100M31.7-08	10	100	8	70	31.75	32	63	8	12.7	2.02	with	TO*T10...
TPA10R100M32.0E08	10	100	8	60	32	28.5	50	8	14.4	2.02	with	TO*T10...

### SPARE PARTS

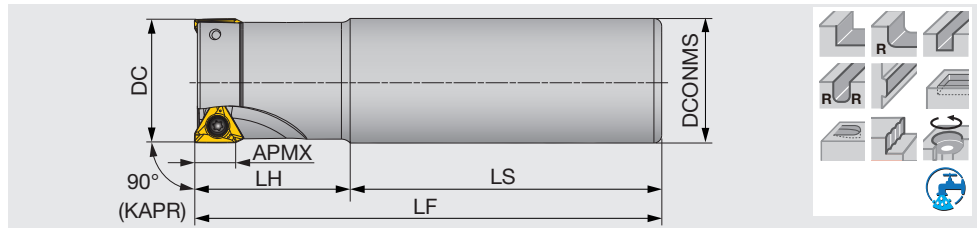
Designation	Clamping screw	Grip	Lubricant	Center bolt	Torx bit
TPA10R040M16.0E04	SR14-562/S	SW6-SD	M-1000	CM8X30H	BLDT10/S7
TPA10R050, 063M...	SR14-562/S	SW6-SD	M-1000	CM10X30H	BLDT10/S7
TPA10R080M...	SR14-562/S	SW6-SD	M-1000	CM12X30H	BLDT10/S7
TPA10R100M...	SR14-562/S	SW6-SD	M-1000	CM16X40H	BLDT10/S7

\*Recommended clamping torque (N·m): SR14-562/S = 3.5

## EPA10

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +9.5°~ +11°, GAMF = -4.5°~ -0.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA10R025M25.0-02N	10	25	2	25	80	35	115	0.38	without	TO*T10...
EPA10R025M25.0-02L	10	25	2	25	150	70	220	0.75	with	TO*T10...
EPA10R028M25.0-02N	10	28	2	25	80	35	115	0.39	without	TO*T10...
EPA10R028M25.0-02L	10	28	2	25	185	35	220	0.78	with	TO*T10...
EPA10R032M32.0-02N	10	32	2	32	80	40	120	0.66	without	TO*T10...
EPA10R032M32.0-03N	10	32	3	32	80	40	120	0.65	without	TO*T10...
EPA10R032M32.0-02L	10	32	2	32	175	80	255	1.46	with	TO*T10...
EPA10R035M32.0-02N	10	35	2	32	80	40	120	0.7	without	TO*T10...
EPA10R035M32.0-03N	10	35	3	32	80	40	120	0.68	without	TO*T10...
EPA10R035M32.0-02L	10	35	2	32	215	40	255	1.52	with	TO*T10...
EPA10R040M32.0-03N	10	40	3	32	80	40	120	0.72	without	TO*T10...
EPA10R040M32.0-04N	10	40	4	32	80	40	120	0.73	without	TO*T10...
EPA10R040M32.0-02L	10	40	2	32	205	50	255	1.57	with	TO*T10...

### SPARE PARTS

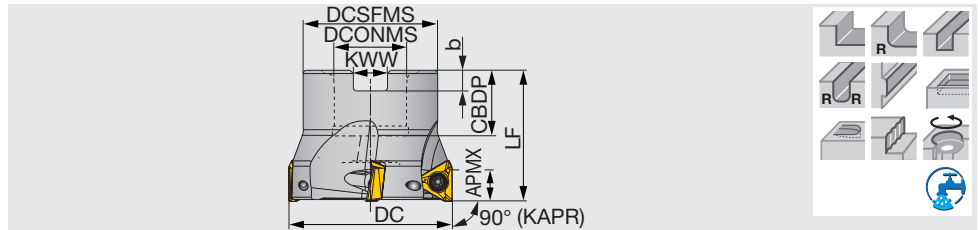
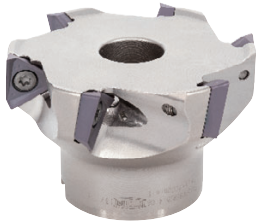
Designation	Clamping screw	Grip	Lubricant	Torx bit
EPA10...	SR14-562/S	SW6-SD	M-1000	BLDT10/S7

\*Recommended clamping torque (N·m): SR14-562/S = 3.5

## TPA15

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +12°~ +13.5°, GAMF = -6°~ -3.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA15R050M22.0E04	15	50	4	41	22	20	40	6.3	10.4	0.27	with	TO*T15...
TPA15R063M22.0E05	15	63	5	41	22	20	40	6.3	10.4	0.41	with	TO*T15...
TPA15R080M25.4-06	15	80	6	46	25.4	26	50	6	9.5	0.83	with	TO*T15...
TPA15R080M27.0E06	15	80	6	50	27	22	50	7	12.4	0.86	with	TO*T15...
TPA15R100M31.7-07	15	100	7	60	31.75	32	50	8	12.7	1.3	with	TO*T15...
TPA15R100M32.0E07	15	100	7	60	32	28.5	50	8	14.4	1.27	with	TO*T15...
TPA15R125M38.1-08	15	125	8	80	38.1	38	63	10	15.9	2.7	with	TO*T15...
TPA15R125M40.0E08	15	125	8	71	40	32	63	9	16.4	2.47	with	TO*T15...
TPA15R160M40.0E10N	15	160	10	100	40	32	63	9	16.4	4.77	without	TO*T15...
TPA15R160M50.8-10N	15	160	10	100	50.8	46	63	11	19	4.4	without	TO*T15...

### SPARE PARTS

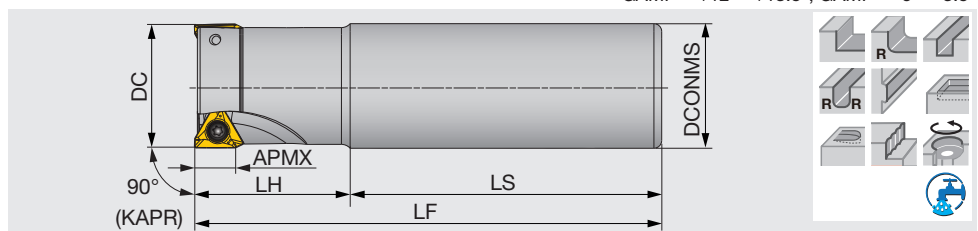
Designation	Clamping screw	Grip	Lubricant	Center bolt 1	Center bolt 2	Torx bit
TPA15R050M22.0E04	TS45120I	H-TB2W	M-1000	-	FSHM10-40H	BT20S
TPA15R063M22.0E05	TS45120I	H-TB2W	M-1000	-	CM10X30H	BT20S
TPA15R080M...	TS45120I	H-TB2W	M-1000	-	CM12X30H	BT20S
TPA15R100M...	TS45120I	H-TB2W	M-1000	TMBA-M16H	-	BT20S
TPA15R125M...	TS45120I	H-TB2W	M-1000	TMBA-M20H	-	BT20M
TPA15R160M...	TS45120I	H-TB2W	M-1000	-	-	BT20M

\*Recommended clamping torque (N·m): TS45120I = 5

## EPA15

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +12°~ +13.5°, GAMF = -6°~ -3.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA15R040M32.0-03N	15	40	3	32	80	40	120	0.73	without	TO*T15...
EPA15R040M32.0-02L	15	40	2	32	205	50	255	1.56	with	TO*T15...
EPA15R050M32.0-04N	15	50	4	32	80	40	120	0.83	without	TO*T15...
EPA15R050M42.0-02L	15	50	2	42	310	50	360	3.84	with	TO*T15...

### SPARE PARTS

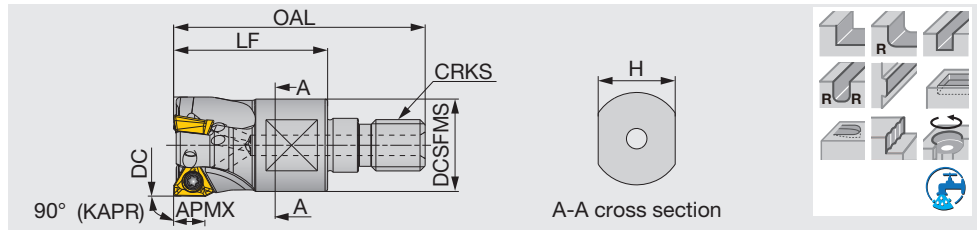
Designation	Clamping screw	Grip	Lubricant	Torx bit
EPA15...	TS45120I	H-TB2W	M-1000	BT20S

\*Recommended clamping torque (N·m): TS45120I = 5

## HPA06-M

High precision square shoulder endmill, modular type, for triangular inserts (TungFlex)

GAMP = +8.5°~ +11.5°, GAMF = -12.5°~ -5.5°



Designation	APMX	DC	CICT	OAL	LF	H	DCSFMS	CRKS	WT(kg)	Air hole	Insert
HPA06R016MM08-02	6	16	2	42	25	10	13	M8	0.03	with	TO*T06...
HPA06R020MM10-03	6	20	3	49	30	15	18	M10	0.06	with	TO*T06...
HPA06R025MM12-04	6	25	4	57	35	17	21	M12	0.1	with	TO*T06...
HPA06R032MM16-05	6	32	5	63	40	22	29	M16	0.20	with	TO*T06...

See page 15 for TungFlex modular shank.

### SPARE PARTS



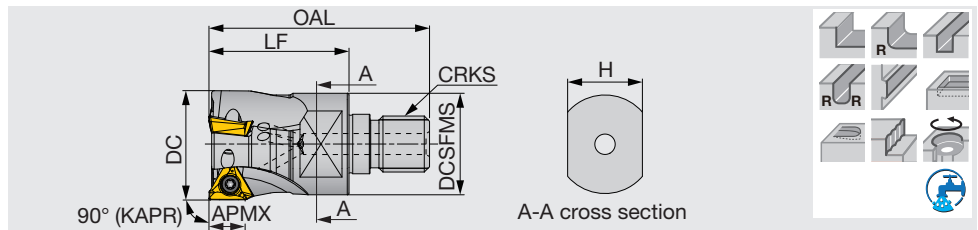
Designation	Clamping screw	Lubricant	Wrench
HPA06R016MM08-02	CSTB-2.5S	M-1000	T-8D
HPA06R020 - 032MM...	CSTB-2.5	M-1000	T-8D

\*Recommended clamping torque (N·m): CSTB-2.5S/CSTB-2.5 = 1.3

## HPA10-M

High precision square shoulder endmill, modular type, for triangular inserts (TungFlex)

GAMP = +9.5°~ +11°, GAMF = -4.5°~ -0.5°



Designation	APMX	DC	CICT	OAL	LF	H	DCSFMS	CRKS	WT(kg)	Air hole	Insert
HPA10R025MM12-02	10	25	2	57	35	17	21	M12	0.08	with	TO*T10...
HPA10R032MM16-03	10	32	3	63	40	22	29	M16	0.18	with	TO*T10...

See page 15 for TungFlex modular shank.

### SPARE PARTS

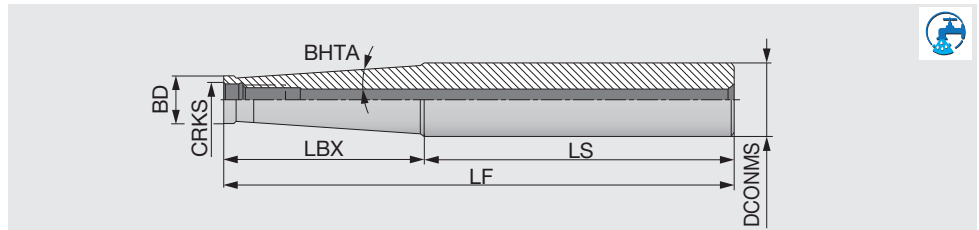


Designation	Clamping screw	Grip	Lubricant	Torx bit
HPA10...	SR14-562/S	SW6-SD	M-1000	BLDT10/S7

\*Recommended clamping torque (N·m): SR14-562/S = 3.5

## TungFlex

### TungFlex modular shank

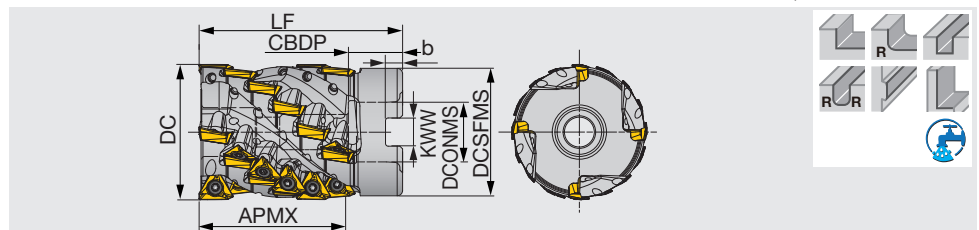


Designation	DCONMS	LF	LS	LBX	BD	CRKS	BHTA	Shank type
SM06-L60C10	10	60	40	20	9.7	M6	0°	Cylindrical
SM06-L105-C12	12	105	45	60	9.7	M6	1.2°	Cylindrical
SM06-L125-C16	16	125	65	60	9.7	M6	3.3°	Cylindrical
SM08-L73C16	16	73	48	25	13	M8	0°	Cylindrical
SM08-L128-C16	16	128	48	80	13	M8	0.9°	Cylindrical
SM08-L170-C20	20	170	103.2	66.8	13	M8	3.3°	Cylindrical
SM10-L80-C20	20	80	50	30	18	M10	0°	Cylindrical
SM10-L130-C20	20	130	50	80	18	M10	0.6°	Cylindrical
SM10-L200-C25	25	200	142.8	57.2	19	M10	3.3°	Cylindrical
SM12-L86-C25	25	86	56	30	21	M12	5.1°	Cylindrical
SM12-L200-C32	32	200	122	78	21	M12	4.4°	Cylindrical
SM16-L95-C32	32	95	60	35	29	M16	1.7°	Cylindrical
SM16-L230-C32	32	230	180	50	29	M16	1.8°	Cylindrical

## TLA10

### Square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +9.5°~ +11°, GAMF = -4.5°~ -0.5°



Designation	APMX	DC	ZEFP	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TLA10R050L054M22.0E04	54	50	4	24	47	22	20	75	6.3	10.4	0.64	with	TO*T10...
TLA10R063L054M25.4-04	54	63	4	24	60	25.4	26	80	6	9.5	1.26	with	TO*T10...
TLA10R063L054M27.0E04	54	63	4	24	60	27	22	80	7	12.4	1.25	with	TO*T10...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

### SPARE PARTS

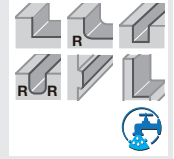
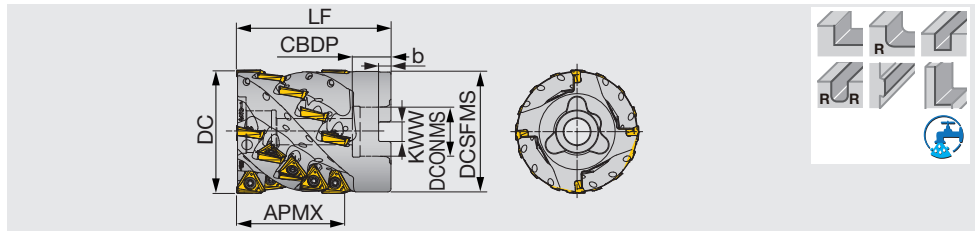
Designation	Clamping screw	Lubricant	Center bolt 1	Center bolt 2	Wrench
TLA10R050L054M22.0E04	SR14-562	M-1000	CAP-CM10X1.5X55-H	-	T-10D
TLA10R063L...	SR14-562	M-1000	-	CAP-CM12X1.75X50	T-10D

\*Recommended clamping torque (N·m): SR14-562 = 3.5

## TLA15-M

Square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +12°~ +13.5°, GAMF = -6°~ -3.5°



Designation	APMX	DC	ZEFP	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TLA15R080L070M31.7-04M	70	80	4	20	78	31.75	32	100	8	12.7	2.29	with	TO*T15...
TLA15R080L070M32.0E04M	70	80	4	20	78	32	25	100	8	14.4	2.38	with	TO*T15...
TLA15R100L083M38.1-05M	83	100	5	30	98	38.1	38	110	10	15.9	4.24	with	TO*T15...
TLA15R100L083M40.0E05M	83	100	5	30	98	40	32	110	9	16.4	4.26	with	TO*T15...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

### SPARE PARTS

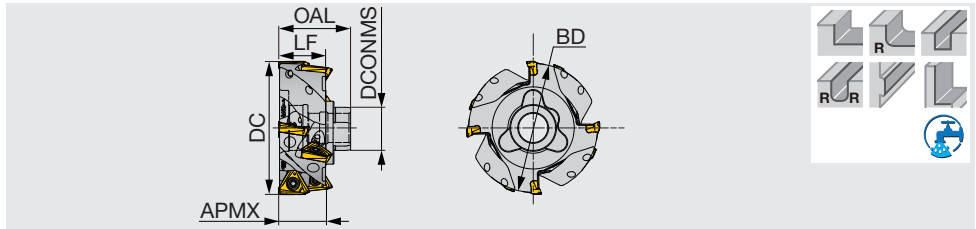
Designation	Clamping screw	Grip	Torx bit	Lubricant	Center bolt
TLA15R080...	TS45120I	H-TB2W	BT20S	M-1000	CM16X75
TLA15R100...	TS45120I	H-TB2W	BT20S	M-1000	CM20X80

\*Recommended clamping torque (N·m): TS45120I = 5

## TLA15-S

Subunit for TLA15-M, square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +12°~ +13.5°, GAMF = -6°~ -3.5°



Designation	APMX	DC	ZEFP	CICT	BD	DCONMS	OAL	LF	WT(kg)	Air hole	Insert
TLA15R080L028-04S	28	80	4	8	77.6	27	43	28.2	0.65	with	TO*T15...
TLA15R100L028-05S	28	100	5	10	97.2	33	46	28	1.05	with	TO*T15...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

### SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit
TLA15...	TS45120I	H-TB2W	M-1000	BT20S

\*Recommended clamping torque (N·m): TS45120I = 5

### CENTER BOLT

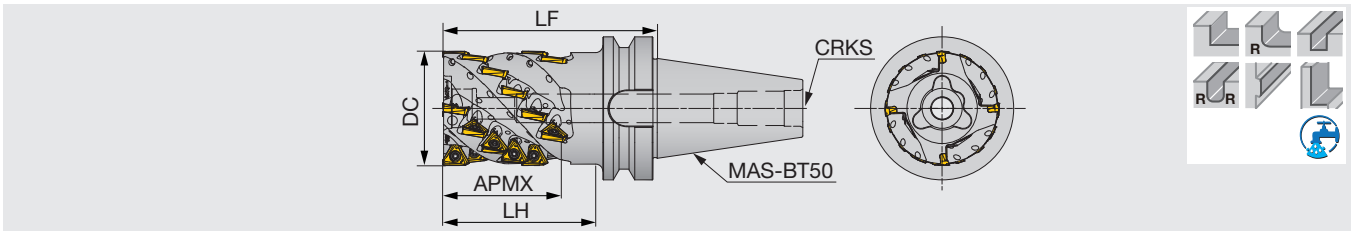
No. of subunits	1	2
TLA15R080L028-04S	CM16x120	CM16x140
TLA15R100L028-05S	CM20x120	CM20x150



## TLA15-BT

Square shoulder mill for roughing, with BT tapered shank, for triangular inserts

GAMP = +12°~ +13.5°, GAMF = -6°~ -3.5°



Designation	APMX	DC	ZEFP	CICT	LF	LH	WT(kg)	Air hole	CRKS	Insert
TLA15R080L083BT50-04M	83	80	4	24	150	107	6.29	with	M24	TO*T15...
TLA15R100L097BT50-05M	97	100	5	35	165	126.5	8.92	with	M24	TO*T15...

### SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit	Shell locking bolt
TLA15R080L083BT50-04M	TS45120I	H-TB2W	M-1000	BT20S	CAP-CM16x2.0x55
TLA15R100L097BT50-05M	TS45120I	H-TB2W	M-1000	BT20S	CAP-CM20x2.5x50

\*Recommended clamping torque (N·m): TS45120I = 5

### CENTER BOLT

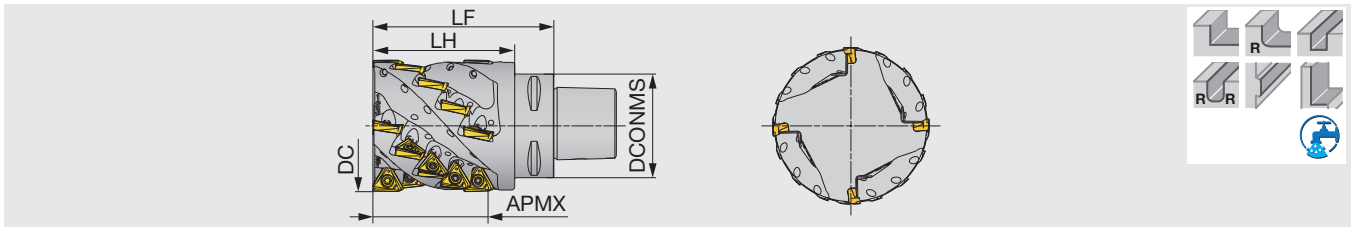
(Optional parts)

No. of subunits	1	2
TLA15R080L083BT50-04M	CAP-CM16x2.0x55	CM16x120
TLA15R100L097BT50-05M	CAP-CM20x2.5x50	CM20x80

## C-TLA

Square shoulder mill for roughing, with PSC, for triangular inserts

GAMP = +13.5°~ +17°, GAMF = -5.5°~ -5°



Designation	APMX	DC	ZEFP	CICT	LF	LH	DCONMS	WT(kg)	Air hole	Insert
C6TLA15M063R03L100	55	63	3	12	100	78	63	2.13	with	TO*T15...
C6TLA15M080R04L110	70	80	4	20	110	86.2	63	3.17	with	TO*T15...

Applicable for 7 MPa coolant

### SPARE PARTS

Designation	Clamping screw	Torx bit	Grip
C6TLA15M0**R0*L1**	TS45120I	BT20S	H-TB2W

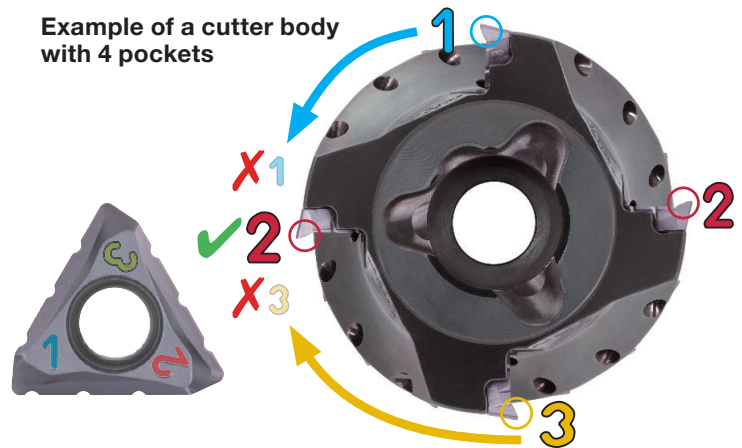
\*Recommended clamping torque (N·m): TS45120I = 5

## Caution for using NMJ chipbreaker

**!** Insert with NMJ chipbreaker has a number marked on each corner. DO NOT place the corners with the same number in adjacent flute as the cutter may be damaged.

For example, if you place the corner #1 in one flute, be sure to use #2 or #3 (and avoid #1) in the next one.

Item: TOMT150608PDER-NMJ



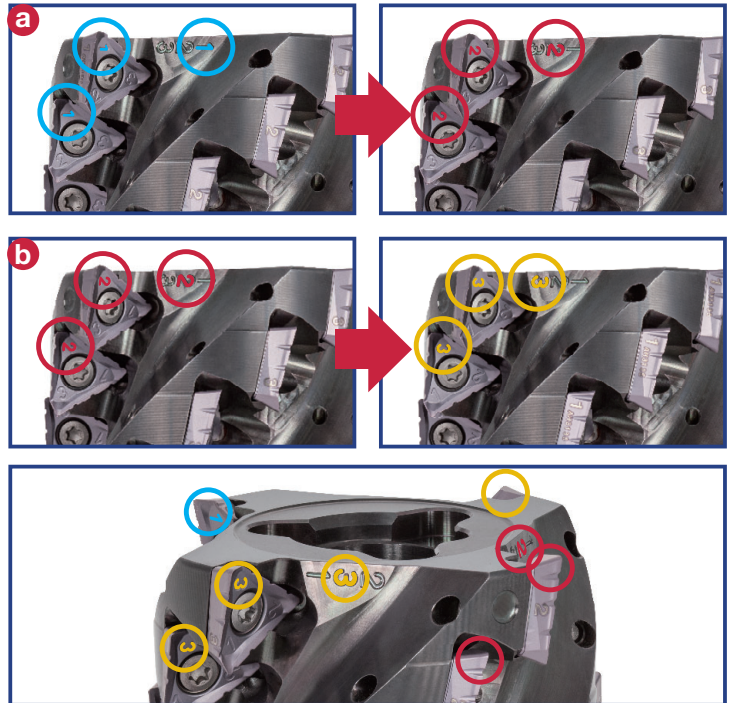
## Directions for setting NMJ inserts on roughing type bodies

- 1 Attach the insert on the cutter body so that the number on the working cutting edge matches the first number marked on the cutter body. (See the image on the right.)
- 2 Attach the remaining inserts on the same flute with the same number marked on the working cutting edge.
- 3 Repeat steps 1 and 2 for the other flutes.
- 4 Make sure the number on the working cutting edge is different from the number used on the adjacent flutes.



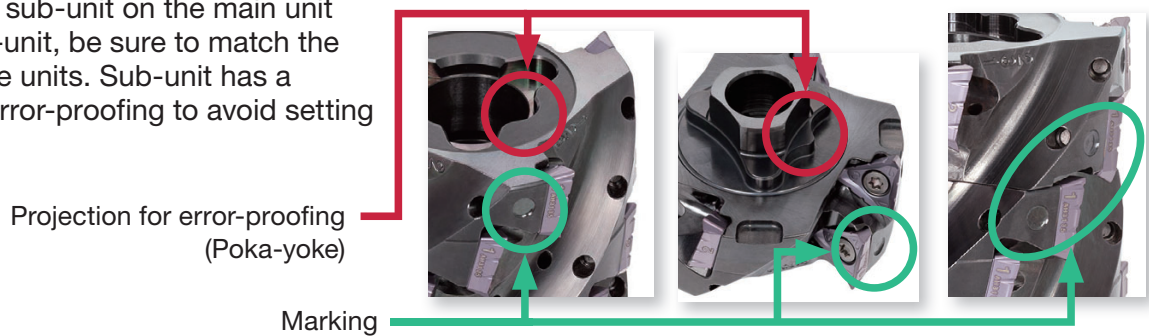
## Directions for changing corners for inserts on roughing type bodies

- 1 a** First time to change the corner rotate the insert clock-wise to match the number on the working cutting edge with the second number marked on the cutter body.  
 (See the image on the right.)  
 Ex: 1 → 2  
       2 → 3  
       3 → 1
- b** Second time to change the corner rotate the insert clock-wise to match the number on the working cutting edge with the last number marked on the cutter body.  
 (See the image on the right.)  
 Ex: 2 → 3  
       3 → 1  
       1 → 2
- 2** Repeat step **1** for all inserts.
- 3** Make sure the number on the working cutting edge is different from the number used on the adjacent flutes.



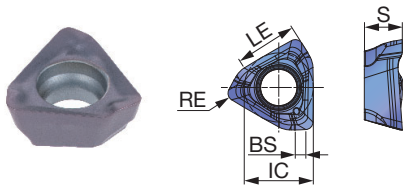
## How to set a sub-unit

When setting a sub-unit on the main unit or another sub-unit, be sure to match the markings on the units. Sub-unit has a projection for error-proofing to avoid setting error.

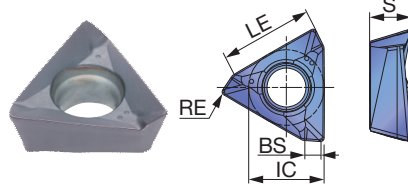


## INSERTS

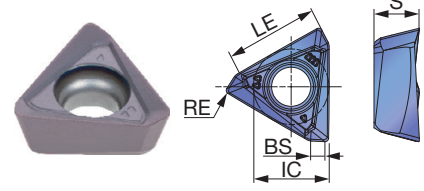
TOMT-MM



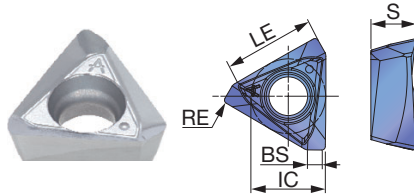
TOMT-MJ



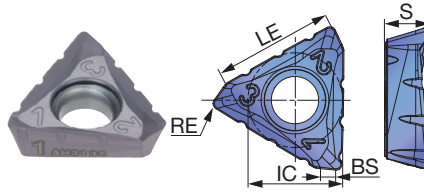
TOET-MJ



TOGT-AJ



TOMT-NMJ



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

★ : First choice  
☆ : Second choice

Insert size	Designation	RE	APMX	Coated						Un-coated	LE	IC	S	BS				
				AH120	AH3135	AH3225	AH8015	T1215	T3225	KS05F								
04	TOMT040204PXER-MM	0.4	3.5	●		●	●											
	TOMT040208PXER-MM	0.8	3.5	●		●	●											
06	TOMT060302PDER-MJ	0.2	6	●	●	●												
	TOMT060304PDER-MJ	0.4	6	●	●	●			●									
	TOMT060308PDER-MJ	0.8	6	●	●	●		●	●									
	TOGT060304PDFR-AJ	0.4	6							●								
	TOGT060308PDFR-AJ	0.8	6							●								
	TOET060302PDER-MJ	0.2	6		●	●												
10	TOET060304PDER-MJ	0.4	6		●	●												
	TOMT100404PDER-MJ	0.4	10	●	●	●			●									
	TOMT100408PDER-MJ	0.8	10	●	●	●		●	●									
	TOMT100416PDER-MJ	1.6	10	●	●	●												
	TOGT100404PDFR-AJ	0.4	10							●								
	TOGT100408PDFR-AJ	0.8	10							●								
	TOET100404PDER-MJ	0.4	10		●	●												
	TOET100408PDER-MJ	0.8	10		●	●												
15	TOMT150604PDER-MJ	0.4	15	●	●	●			●									
	TOMT150608PDER-MJ	0.8	15	●	●	●		●	●									
	TOMT150616PDER-MJ	1.6	15	●	●	●												
	TOMT150620PDER-MJ	2	15	●	●	●												
	TOMT150608PDER-NMJ	0.8	15	●	●	●			●									
	TOGT150604PDFR-AJ	0.4	15							●								
	TOGT150608PDFR-AJ	0.8	15							●								
	TOET150604PDER-MJ	0.4	15		●	●												
	TOET150608PDER-MJ	0.8	15		●	●												

● : Line up  
● : New product

## STANDARD CUTTING CONDITIONS

### EPA04

ISO	Workpiece materials	Hardness	Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
P	Low carbon steel SS400, S15C, etc. E275A, C15E4, etc.	- 200 HB	AH3225	100 - 250	0.05 - 0.12
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	AH3225	100 - 230	0.05 - 0.12
	Prehardened steel NAK80, PX5, etc.	30 - 40 HRC	AH3225	100 - 180	0.05 - 0.1
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	AH3225	90 - 200	0.05 - 0.1
K	Grey cast iron FC250, etc. 250, etc., GGG25, etc.	150 - 250 HB	AH120	100 - 300	0.05 - 0.12
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG45, etc.	150 - 250 HB	AH120	100 - 200	0.05 - 0.12
S	Titanium alloys Ti-6Al-4V, etc.	-	AH3225	20 - 60	0.04 - 0.07
	Heat-resistant alloys Inconel 718, etc.	-	AH8015	20 - 40	0.04 - 0.07
H	Hardened steel	SKD61, etc. X40CrMoV5-1, etc.	AH8015	50 - 150	0.04 - 0.07
		SKD11, etc. X153CrMoV12, etc.	AH8015	40 - 70	0.04 - 0.07

- Remove excessive chip accumulation with an air blast.
- For an operation when the depth of cut varies (ex. casting skin) or machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

- Cutting conditions may be limited depending on 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.

## T/E/HPA06, T/E/HPA10, T/EPA15

ISO	Workpiece materials	Hardness	Priority	Chip-breakers	Grades	T/E/HPA06		T/E/HPA10		T/EPA15		
						Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
											MJ/AJ	NMJ
P	Low carbon steel SS400, S15C, etc. E275A, C15E4, etc.	- 200 HB	First choice	MJ/NMJ	AH3225	100 - 220	0.05 - 0.15	100 - 250	0.08 - 0.2	100 - 300	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.08 - 0.1	100 - 300	0.08 - 0.12	100 - 300	0.08 - 0.15	0.08 - 0.15
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	First choice	MJ/NMJ	AH3225	100 - 170	0.05 - 0.12	100 - 250	0.06 - 0.22	100 - 250	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.05 - 0.1	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
	Prehardened steel and tool steel NAK80, PX5, SKD61, etc. X40CrMoV5-1, etc.	30 - 40 HRC	First choice	MJ/NMJ	AH3225	100 - 120	0.05 - 0.12	100 - 200	0.06 - 0.22	100 - 200	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.05 - 0.1	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	First choice	MJ/NMJ	AH3135	80 - 150	0.05 - 0.15	80 - 200	0.08 - 0.2	90 - 200	0.08 - 0.2	0.08 - 0.15
			Wear resistance	MJ/NMJ	T3225	90 - 200	0.05 - 0.1	90 - 250	0.05 - 0.12	90 - 250	0.05 - 0.15	0.05 - 0.15
K	Grey cast iron FC250, etc. 250, etc. GG25, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	100 - 200	0.05 - 0.15	100 - 250	0.05 - 0.15	140 - 250	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	150 - 250	0.05 - 0.12	150 - 300	0.08 - 0.2	200 - 300	0.08 - 0.18	-
	Ductile cast iron FCD450, etc. 450-10S, etc. GGG45, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	80 - 150	0.05 - 0.15	80 - 200	0.08 - 0.2	110 - 200	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	100 - 200	0.05 - 0.12	130 - 250	0.05 - 0.15	150 - 250	0.08 - 0.18	-
N	Aluminium Si < 13%	40 - 50 HRC	First choice	AJ	KS05F	300 - 900	0.08 - 0.22	300 - 1000	0.08 - 0.22	300 - 1000	0.08 - 0.22	-
	Aluminium Si ≥ 13%	50 - 60 HRC	First choice	AJ	KS05F	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	-
S	Titanium alloys Ti-6Al-4V, etc.	-	First choice	MJ/NMJ	AH3135	20 - 50	0.05 - 0.1	20 - 60	0.05 - 0.1	20 - 60	0.08 - 0.15	0.08 - 0.15
	Heat-resistant alloys Inconel 718, etc.	-	First choice	MJ/NMJ	AH120	20 - 35	0.03 - 0.08	20 - 40	0.05 - 0.13	20 - 40	0.07 - 0.15	0.07 - 0.15

- When you use the NMJ chipbreaker, please set up the feed less than 0.15 mm/t.
- Remove excessive chip accumulation with an air blast.
- For an operation when the depth of cut varies (ex.casting skin) or machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

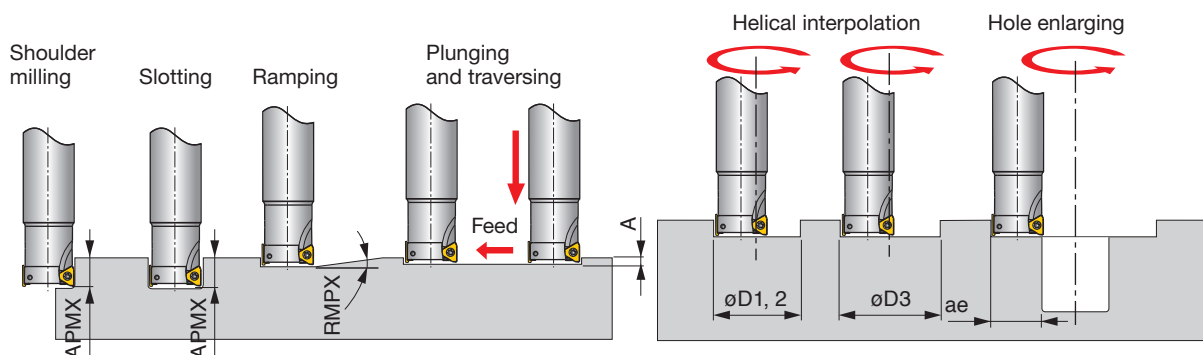
- Cutting conditions may be limited depending on machine power, workpiece rigidity, and spindle output. When the cutting width, depth, or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

## TLA (Roughing type)

ISO	Workpiece materials	Hardness	Priority	Chip-breakers	Grades	TLA10		TLA15		
						Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
									MJ/AJ	NMJ
P	Low carbon steel SS400, S15C, etc. E275A, C15E4, etc.	- 200 HB	First choice	MJ/NMJ	AH3225	100 - 250	0.08 - 0.2	100 - 300	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.08 - 0.12	100 - 300	0.08 - 0.15	0.08 - 0.15
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	First choice	MJ/NMJ	AH3225	100 - 250	0.06 - 0.22	100 - 250	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
	Prehardened steel and tool steel NAK80, PX5, SKD61, etc. X40CrMoV5-1, etc.	30 - 40 HRC	First choice	MJ/NMJ	AH3225	100 - 200	0.06 - 0.22	100 - 200	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	First choice	MJ/NMJ	AH3135	80 - 200	0.08 - 0.2	90 - 200	0.08 - 0.2	0.08 - 0.15
			Wear resistance	MJ/NMJ	T3225	90 - 250	0.05 - 0.12	90 - 250	0.05 - 0.15	0.05 - 0.15
K	Grey cast iron FC250, etc. 250, etc. GG25, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	100 - 250	0.05 - 0.15	140 - 250	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	150 - 300	0.08 - 0.2	200 - 300	0.08 - 0.18	-
	Ductile cast iron FCD450, etc. 450-10S, etc. GGG45, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	80 - 200	0.08 - 0.2	110 - 200	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	130 - 250	0.05 - 0.15	150 - 250	0.08 - 0.18	-
N	Aluminium Si < 13%	40 - 50 HRC	First choice	AJ	KS05F	300 - 1000	0.08 - 0.22	300 - 1000	0.08 - 0.22	-
	Aluminium Si ≥ 13%	50 - 60 HRC	First choice	AJ	KS05F	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	-
S	Titanium alloys Ti-6Al-4V, etc.	-	First choice	MJ/NMJ	AH3135	20 - 60	0.05 - 0.1	20 - 60	0.08 - 0.15	0.08 - 0.15
	Heat-resistant alloys Inconel 718, etc.	-	First choice	MJ/NMJ	AH120	20 - 40	0.05 - 0.13	20 - 40	0.07 - 0.15	0.07 - 0.15

· When using NMJ chipbreaker, please set up the feed not to exceed 0.15 mm/t.

## APPLICATION RANGE




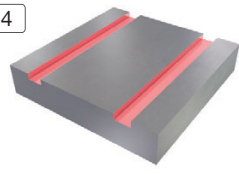
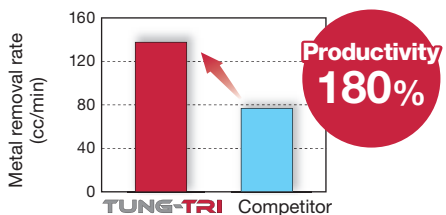
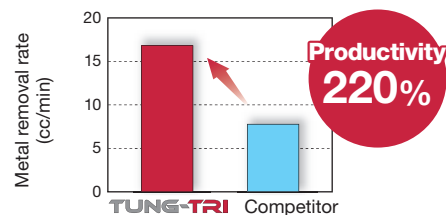
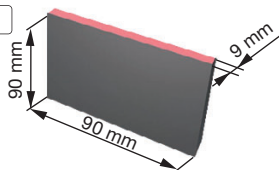
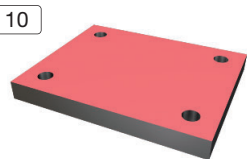
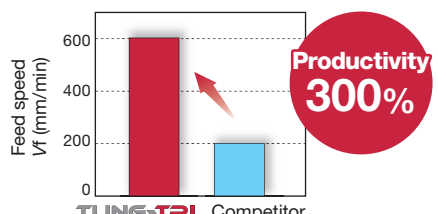
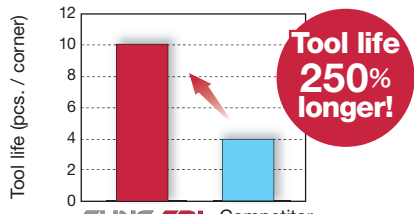
Designation	DC	Max. depth of cut	Max. ramping angle	Max. plunging depth	Min. machining diameter	Max. machining diameter		Max. cutting width in enlarging
		APMX	RMPX	A	øD1	øD2	øD3*	ae
EPA04R008...	8	3.5	0.3°	0.02	12.8	15.6	13.6	7.5
EPA04R010...	10	3.5	0.2°	0.02	16.8	19.6	17.6	9.5
EPA04R012...	12	3.5	0.15°	0.02	20.8	23.6	21.6	11.5
EPA04R016...	16	3.5	0.1°	0.02	28.8	31.6	29.6	15.5
EPA04R020...	20	3.5	0.1°	0.02	36.8	39.6	37.6	19.5
EPA04R025...	25	3.5	0.1°	0.02	46.8	49.6	47.6	24.5
EPA06R012...	12	6	5°	0.6	18	23.6	21	11.5
E/HPA06R016...	16	6	4.3°	0.6	25	31.6	29	15.5
EPA06R018...	18	6	3.5°	0.6	29.5	35.6	33	17.5
E/HPA06R020...	20	6	2.8°	0.6	33.5	39.6	37	19.5
EPA06R022...	22	6	2.5°	0.6	37.5	43.6	41	21.5
E/HPA06R025...	25	6	2°	0.6	43.5	49.6	47	24.5
E/HPA10R025...	25	10	2°	0.6	42.1	49.6	47	24.5
EPA06R028...	28	6	1.8°	0.6	49.5	55.6	53	27.5
EPA10R028...	28	10	2°	0.6	48.1	55.6	53	27.5
T/HPA06R032...	32	6	1.5°	0.6	57.5	63.6	61	31.5
E/HPA10R032...	32	10	2°	0.6	56.1	63.6	61	31.5
EPA10R035...	35	10	1.7°	0.6	62.1	69.6	67	34.5
TPA06R040...	40	6	1°	0.6	73.5	79.6	77	39.5
T/EPA10R040...	40	10	1.4°	0.6	72.1	79.6	77	39.5
EPA15R040...	40	15	2.3°	0.8	68.5	79.2	75.5	39
TPA06R050...	50	6	0.7°	0.6	94	99.6	97	49.5
TPA10R050...	50	10	0.9°	0.6	92.1	99.6	97	49.5
T/EPA15R050...	50	15	1.7°	0.8	88.5	99.2	95.5	49
TPA10R063...	63	10	0.8°	0.6	118.1	125.6	123	62.5
TPA15R063...	63	15	1.4°	0.8	114.5	125.2	121.5	62
TPA10R080...	80	10	0.6°	0.6	152.1	159.6	157	79.5
TPA15R080...	80	15	1°	0.8	148.5	159.2	155.5	79
TPA10R100...	100	10	0.5°	0.6	192.1	199.6	197	99.5
TPA15R100...	100	15	0.8°	0.8	188.5	199.2	195.5	99
TPA15R125...	125	15	0.6°	0.8	238.5	249.2	245.5	124
TPA15R160...	160	15	0.5°	0.8	308.5	319.2	315.5	159

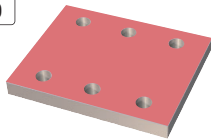
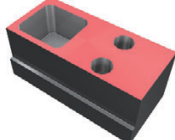
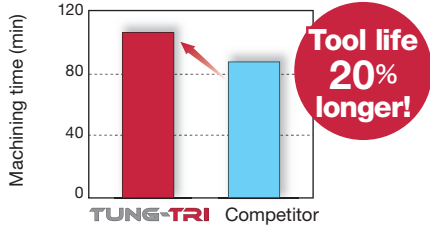
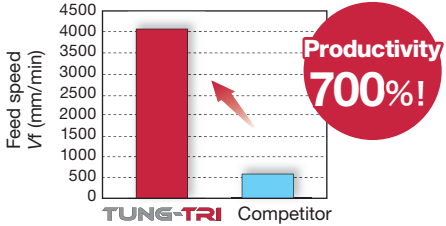
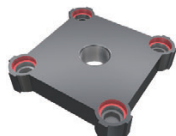
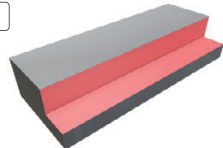
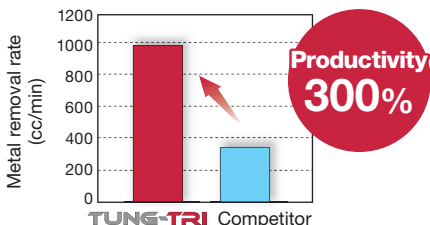
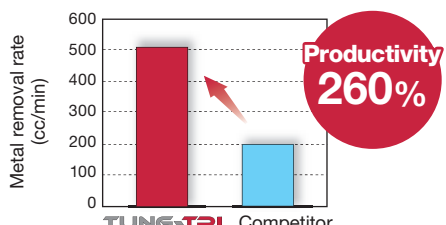
\* Flat bottom hole

Note: Corner RE for dimensions of øD1, øD2 and øD3: RE = 0.4 for EPA04, T/E/HPA06, T/E/HPA10 and RE = 0.8 for T/EPA15.



## PRACTICAL EXAMPLES

Workpiece type		Rotator shaft	Machine part
Cutter		EPA04R025M25.0-06 (ø25 mm, z = 6)	EPA04R010M10.0-02 (ø10 mm, z = 2)
Insert		TOMT040204PXER-MM	TOMT040204PXER-MM
Grade		AH3225	AH3225
Workpiece material		SNCM439 / 40CrNiMoA	S50C / C50
Insert size 04		 <b>P</b>	 <b>P</b>
Cutting conditions	Cutting speed: Vc (m/min)	200	110
	Feed per tooth: fz (mm/t)	0.12	0.12
	Feed speed: Vf (mm/min)	1833	840
	Depth of cut : ap (mm)	3	2
	Width of cut : ae (mm)	25	10
	Machining	Slotting	Slotting
	Coolant	Air blast	Air blast
	Overhang length (mm)	35	30
Machine		Vertical M/C, BT50	Vertical M/C, BT30
Results		 <p>Thanks to the close pitch cutter design and large axial rake, <b>Tung-Tri</b> offered high productivity, while eliminating chip packing.</p>	 <p><b>Tung-Tri's</b> large axial rake enabled smooth entry to the cut and greater depth of cut without generating chatter.</p>
Workpiece type		Plate	Block
Cutter		EPA06R020M20.0-03N (ø20 mm, z = 3)	TPA10R063M22.0E06 (ø63 mm, z = 6)
Insert		TOMT060304PDER-MJ	TOMT100408PDER-MJ
Grade		AH3135	T1215
Workpiece material		SUS304 / X5CrNi18-9	FCD700
Insert size 06		 <b>M</b>	 <b>K</b>
Cutting conditions	Cutting speed: Vc (m/min)	125	196
	Feed per tooth: fz (mm/t)	0.083	0.15
	Feed speed: Vf (mm/min)	600	900
	Depth of cut : ap (mm)	1.5	2.5
	Width of cut : ae (mm)	9	54.5
	Machining	Face milling	Face milling
	Coolant	Dry	Dry
Machine		BT40	BT40
Results		 <p>Unique cutting edge geometry delivered low cutting forces and eliminated chatter, enabling highly efficient machining of thin steel plate.</p>	 <p>T1215 exhibited superior wear resistance, extending the tool life by over 250%.</p>

Workpiece type		Blank	Machine part
Cutter		EPA10R040M32.0-04N (ø40 mm, z = 4)	EPA10R025M25.0-02N (ø25 mm, z = 2)
Insert		TOMT100408PDER-MJ	TOGT100408PDRF-AJ
Grade		AH3135	KS05F
Workpiece material		Titanium Insert size 10  <b>S</b>	AC4B Insert size 10  <b>N</b>
Cutting conditions	Cutting speed: Vc (m/min)	55	457
	Feed per tooth: fz (mm/t)	0.1	0.3
	Feed speed: Vf (mm/min)	175	4072
	Depth of cut : ap (mm)	2.5	1.27
	Width of cut : ae (mm)	25	-
	Machining	Face milling	Face milling
	Coolant	Wet (External coolant)	Wet (External coolant)
Machine		Vertical M/C, BT50	Vertical M/C, BT40
Results		 <p>Sharp cutting edge prevented chip welding, extending tool life by 20%.</p>	 <p>AJ chipbreaker exhibited high fracture resistance even in a demanding cutting condition.</p>
Workpiece type		Molding machine part	Generator
Cutter		TLA15R080L070M31.7-04M (ø80 mm) TLA15R080L028-04S	TLA15R100L083M38.1-05M (ø100 mm, z = 5)
Insert		TOMT150608PDER-MJ	TOMT150608PDER-NMJ
Grade		AH120	AH3135
Workpiece material		FCD400 / 400-15S Insert size 15  <b>K</b>	S45C / C45 Insert size 15  <b>P</b>
Cutting conditions	Cutting speed: Vc (m/min)	180	160
	Feed per tooth: fz (mm/t)	0.2	0.16
	Feed speed: Vf (mm/min)	573.0	407
	Depth of cut : ap (mm)	74	50
	Width of cut : ae (mm)	24	25
	Machining	Contouring	Shoulder milling (Roughing)
	Coolant	Dry	Wet (External coolant)
Machine		Vertical M/C, BT50	Vertical M/C, BT50
Results		 <p>MJ insert provided reduced cutting forces and dramatic improvement of machining efficiency.</p>	 <p>The serrated cutting edges of the NMJ chipbreaker significantly reduced vibration, while outputting a high MMR.</p>

# FIXED TORQUE WRENCH

Achieves high cutting edge precision thanks to uniform clamping force

## Easy setting

### Handle

Multi-component handle optimally designed for the hand enables ideal power transmission.



### Mechanism

Driver clicks to alert the operator when the preset torque is attained. IDs printed on the handle end allow easy identification of the driver specs. Driver has unlimited loosening torque. Driver mechanism is industrial-lubricant-resistant.

## High repeatability & robustness

### Robustness / Fitting

Wiha ChromTop® finish on tip for a perfect fit every time. Durability thanks to high quality chrome-vanadium-molybdenum steel, through hardened, chrome-plated.

### Versatility

Extra slim blade geometry is particularly suitable for applications with confined narrow access.



## Handle

Ex) **TW - D - 0.6NM**

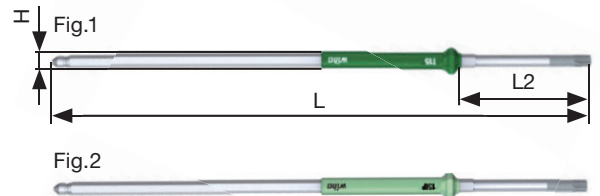


Designation	Stock	Torque (N-m)	Accuracy (%)	øD	L
TW-D-0.6NM	●	0.6	10	34	130
TW-D-0.9NM	●	0.9	10	34	130
TW-D-1.1NM	●	1.1	10	34	130
TW-D-1.4NM	●	1.4	10	34	130
TW-D-2.5NM	●	2.5	10	34	130
TW-D-3.0NM	●	3.0	10	34	130
TW-D-3.5NM	●	3.5	10	34	130

1 piece per package

## Blade

Ex) **TW - B - T6**



Designation	Stock	TORX geom.	H	L	L2	Fig.
TW-B-T6	●	T6	4	175	42	1
TW-B-T7	●	T7	4	175	42	1
TW-B-T8	●	T8	4	175	42	1
TW-B-T9	●	T9	4	175	42	1
TW-B-T10	●	T10	4	175	42	1
TW-B-T15	●	T15	4	175	42	1
TW-B-6IP	●	6IP	4	175	42	2
TW-B-7IP	●	7IP	4	175	42	2
TW-B-8IP	●	8IP	4	175	42	2
TW-B-10IP	●	10IP	4	175	42	2
TW-B-15IP	●	15IP	4	175	42	2

1 piece per package

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Jan. 2022 (TJ)